San Antonio Missions National Historical Park

FIRE MANAGEMENT PLAN

Approval: _____ _____
Superintendent Date

12.7.04

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Overview

San Antonio Missions National Historical Park is an urban park that includes four missions (owned and used by the Catholic Archdiocese of San Antonio) and associated structures. While the grounds are well maintained, brushy areas occur in the labores and are significant there. The park is currently a suppression only fire program. Wildland fires are suppressed by the city fire department. Hazardous fuel reduction treatments are limited to mechanical and chemical efforts, as open burning is not allowed within the city. The park also includes a ranch (Rancho de las Cabras) near Floresville. This site has 99 acres of brushy fuels and includes the buried ruins of a chapel and ranch buildings. It is within the fire response zone of the Floresville Volunteer Fire Department. Fires escaping initial attack will rapidly move off site and command will transfer to the Texas Forest Service. The park will coordinate with suppression resources through a resource advisor (the Chief Ranger or designee). The resource management goal is to restore a historic scene typical of the Spanish colonial period. The park currently uses mechanical and chemical treatments to control brush and may implement prescribed fire treatments, covered under NEPA categorical exclusions, in 2009. Fire use is not practical at the missions as it is an urban area, nor at Rancho de las Cabras due to it's size.

I. INTRODUCTION

National Park Service policy [*Director's Order #18, section 5.2.a.]* states: "Every park area with burnable vegetation must have a fire management plan approved by the Superintendent." The overall resource management objectives for an NPS unit must guide Fire Management Plans. Resource management objectives will determine whether, and how, fire will be managed. Activities covered by the Fire Management Plan will be given due consideration in balance with other NPS unit management activities. This plan will help achieve resource management objectives as defined in the Resource Management Plan, and it will guide all fire management activities including the prevention and suppression of wildfire, the application of prescribed fire, the reduction of hazardous fuels, and will be coordinated with the public, neighboring land owners, and land management agencies.

This plan was developed in a collaborative process between City of San Antonio agencies, the management and resource management staff at San Antonio Missions, and the fire management staff at Big Thicket National Preserve. As this plan is implemented additional coordination and collaboration will develop between the park and other fire management agencies, such as: the Texas Forest Service, San Antonio Fire Department, and the Floresville Volunteer Fire Department.

The Fire Management Plan will implement fire management policies and help achieve resource management and fire management goals as defined in: (1) Federal Wildland Fire Management Policy and Program Review; (2) Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (USDOI/USDA); and (3) A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

In compliance with the National Environmental Protection Act an Environmental Assessment was prepared in 2000 for exotic species removal within the park. This assessment covers the same area as the fire management plan and it was determined that the fire management plan

would be adequately covered through this EA since the fire management plan is for suppression. (Copy of letter as Appendix C).

Compliance with the National Historical Preservation Act (NHPA) is accomplished by completing the Assessment of Effort form, on an as needed basis.

The authority for fire management is found in the National Park Service's Organic Act of 1916, 16 USC 1 through 4. This authority is further clarified in the National Parks and Recreation Act of 1978. Primary Policy guidance for implementing this plan are contained in Departmental Manuals (section 910), NPS Policies of 1988, NPS-77 Natural Resources Management Guidelines, Directors Orders 18, and Reference Manual 18 Wildland Fire Management Guidelines of 1999, the San Antonio Missions National Historical Park General Management Plan/Development Concept Plan (1982), and the Rancho de las Cabras amendment to the General Management Plan (1990),

II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY

A. NPS Management Policies

NPS fire management activities will be performed in accordance with the principles, policies, and recommendations of the Final Report of the Federal Wildland Fire Management Policy and Program Review, and with Part 620 of the Departmental Manual. Air operations during wildland fire incidents will comply with the provisions of Director's Order #60 (Aviation Management) and Parts 350-354 of the Departmental Manual.

The Associate Director for Park Operations and Education will prepare and issue a reference manual to help NPS managers and field staff understand and implement Departmental and NPS policies applicable to fire management. The reference manual will contain detailed procedures emphasizing personnel safety, the use of wildland fire for beneficial purposes, monitoring of smoke behavior and the concept of risk management.

The superintendent of each park having burnable vegetation will ensure that the manual referenced in paragraph 4.6 of Directors Order 18 (i.e. Reference Manual – 18) is available in sufficient quantities to serve the needs of fire management staff within the park, and will ensure that fire management staff is adequately versed in the Departmental and NPS policies and procedures contained therein.

The Associate Director for Natural Resource Stewardship and Science will develop, in concert with the Associate Director for Park Operations and Education: (1) a research program to address scientific information needs, technological needs and advances, risk assessment, social and economic concerns, and public health concerns; (2) procedures to ensure that park resource management plans adequately take into account the positive values of wildland and prescribed fire as a tool for ecosystem management; and (3) a primer to assist all NPS personnel in accomplishing the objective of paragraph 4.8.

To implement NPS *Management Policies* governing fire management, the NPS will administer its wildland fire program in a manner that will:

Educate employees and the public about the scope and effect of wildland fire management, including fuels management, resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.

Stabilize and prevent further degradation of natural and cultural resources lost in and/or damaged by impacts of wildland fires and/or fire management activities.

Maintain the highest standards of professional and technical expertise in planning and safely implementing an effective wildland fire management program.

Integrate fire management with all other aspects of park management.

Manage wildland fire incidents in accordance with accepted interagency standards, using appropriate management strategies and tactics and maximize efficiencies realized through interagency coordination and cooperation.

Scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program.

Protect life and property and accomplish resource management objectives, including restoration of the natural role of fire in fire-dependent ecosystems.

Effectively integrate the preservation of wilderness including the application of "minimum requirement" management techniques into all activities impacting this resource.

B. San Antonio Missions Authorization

Authorization of San Antonio Missions National Historical Park (Public Law 95-629, Title II) occurred on November 10, 1978 and was established for the following purposes:

"In order to provide for the preservation, restoration, and interpretation of the Spanish Missions of San Antonio, Texas, for the benefit and enjoyment of present and future generations, there is hereby established the San Antonio Missions National Historical Park consisting of Concepción, San José, San Juan, and Espada Missions, together with areas and features historically associated therewith, (i.e. the Espada Acequia, Espada Dam and Aqueduct, and the San Juan Acequia).

This legislation was amended by Public Law 101-628, Title V, on November 28, 1990 to add Rancho de las Cabres, the acepia water system, and continue land acquisition within the boundary.

San Antonio Missions National Historical Park contains the largest concentration of cultural resources from the Spanish colonial period in the United States. Many of these resources continue to be used today for irrigation, education, worship [owned by the Catholic Archdiocese of San Antonio], and as active community parishes, making them a living link from the historical past to the present. They provide a greater understanding and appreciation of the Spanish colonial influence in the New World through interpretation of the historical and architectural values of the San Antonio Missions.

C. General Management Plan

The General Management Plan and Development Concept Plan (GMP/DCP) defines natural resource objectives applicable to this Fire Management Plan as:

> "Because the original natural environment of the San Antonio missions has been extensively altered or destroyed by man's intervention during the past three centuries, the goals for natural resource management are limited to (1) protecting and improving the condition of existing resources and (2) where feasible, returning the condition and appearance of the landscape to a state which better reflects the spirit of the mission period. The latter must be undertaken only in coordination with management of the cultural resources and after sufficient research has been accomplished. Upon completion of studies, the National Park Service will consider the appropriateness and economic feasibility of natural restorations aimed towards more historically accurate or natural conditions. The Advisory Council on Historic Preservation and the Texas State Historical Preservation Officer will be informed of all major land/vegetation management projects to be undertaken by the National Park Service."

Additionally the GMP/DCP states:

> "Recently introduced exotic vegetation will be replaced or supplemented with native species or with species introduced during the Spanish colonial period. Landscape rehabilitation will be undertaken where necessary..."

The GMP/DCP also addresses the need for research for vegetation management, stating:

> "Horticultural research will guide the development of management plans and techniques to preserve both native species and those exotic species introduced in Spanish colonial times. Guidelines will be developed to initiate plantings of native species or to encourage enhancement of native species populations. Woodlands will be managed to prevent increased domination by exotics and to remove particularly noxious or hazardous species."

D. Resources Management Plan

The park's Natural Resource Management Plan discusses the need to control exotic vegetative species, protect the remaining "witness" trees which may provide valuable dendrochronological information relating to the mission era, and rehabilitation of

historic landscapes. The plan specifically notes that prescribed fire should be a critical component in achieving these goals.

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E. Fire Management Plan

The Fire Management Plan (FMP) is an integral subsection of the Resource Management Plan (RMP). The FMP serves as a framework for achieving wildland fire management objectives identified by the RMP including: reduction of hazardous fuels, control of exotic species, support of threatened and endangered species, rehabilitation and maintenance of historic landscapes, and visitor safety. These objectives will be achieved through the selection of the appropriate management strategies and actions on wildland fires.

III. WILDLAND FIRE MANAGEMENT STRATEGIES

A. General Management Considerations

The primary goal of San Antonio Missions is to restore and maintain historical landscapes to represent the mid-1700's period of development at the Missions, within existing social and political constraints inherent in a large metropolitan area and the service's limited land ownership.

Fire management plans, programs, and activities will be based upon the best available science, and utilize fire as a natural process and as a tool to maintain and restore cultural landscapes or dispose of vegetation and debris; ensure that cost effective programs and activities are based on values, risk management, and resource management objectives; standardize procedures among federal agencies, and encourage interagency coordination, cooperation, and involvement of all parties.

Fire management planning, preparedness, prevention, suppression, restoration and rehabilitation, monitoring, and education will be conducted on an interagency basis with the involvement of cooperators and partners. San Antonio Missions National Historical Park will provide certified employees and equipment to participate in regional and national assignments per national fire level determinations. The Fire Management Officer at Big Thicket National Preserve will provide fire management assistance, oversight, and national dispatch coordination. The park will pursue agreements with local agencies, volunteer fire departments, and civic groups for wildland fire management and urban interface actions.

San Antonio Missions National Historical Park interacts integrally with Los Compadres, and the four Catholic churches. Los Compadres is an organization that contributes time and funds to various projects benefiting the Missions. The park also has an integral relationship with the active Catholic churches at each of the mission sites. The Catholic

Archdiocese oversees the preservation and maintenance of the churches, and the Park manages the preservation and maintenance of all other buildings and grounds.

The park also works with other agencies and organizations to protect Park resources; including: Stinson Airport, San Antonio River Authority, Brooks City Base, United States Geological Survey - Water Resource Division, San Antonio Water Systems, Texas Department of Transportation, Texas Commission on Environment Quality, Texas Parks and Wildlife (San Antonio) - Urban Biology, Texas Parks and Wildlife (Austin) - Natural Diversity, United States Fish and Wildlife Service (Austin), Texas Forest Service, San Antonio South Side Chamber of Commerce, Ditchmaster of Espada Acequia, the San Antonio Conservation Society, the Texas Historical Commission (THC), the City of San Antonio, and Bexar & Wilson Counties.

There is a state-wide All-Risk Memorandum Of Understanding between the Texas Forest Service, US Fish & Wildlife-Region 2, National Park Service-Intermountain Region, the Nature Conservancy-Texas Chapter, and the National Forests of Texas completed July 2004 (Appendix E).

B. Wildland Fire Management Goals.

General Goals

To implement NPS *Management Policies* governing fire management, the NPS will administer its wildland fire program in a manner that will:

- Educate employees and the public about the scope and effect of wildland fire management, including fuels management, resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.

- Stabilize and prevent further degradation of natural and cultural resources lost in and/or damaged by impacts of wildland fires and/or fire management activities.

- Maintain the highest standards of professional and technical expertise in planning and safely implementing an effective wildland fire management program.

- Integrate fire management with all other aspects of park management.

- Manage wildland fire incidents in accordance with accepted interagency standards, using appropriate management strategies and tactics and maximize efficiencies realized through interagency coordination and cooperation.

- Scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program.

- Protect life and property and accomplish resource management objectives, including restoration of the natural role of fire in fire-dependent ecosystems.

- NPS employees will take advantage of appropriate opportunities to educate the public about the positive values of wildland fire and the manner in which the NPS manages fire to meet ecosystem management objectives.

The NPS is committed to protecting park resources and natural ecological processes; but firefighter and public safety must be the first priority in all fire management activities.

All naturally caused wildland fires may be managed to accomplish resource management goals, provided there is an approved fire management plan, and provided they do not compromise firefighter and public safety, threaten property, or violate air quality laws or regulations.

Specific Goals

- Protection of human life and property, both within and adjacent to the Park boundaries. Ensure that firefighter safety is the highest priority of every fire management activity.

- Suppress all wildland fires to protect the public, private property, natural, cultural and historic resources of the unit, and investigate all unplanned human-caused fires.

- Manage the wildland fire program in accordance with congressional intent as expressed in the annual appropriations act and enabling legislation, and comply with applicable departmental manual and agency policies and procedures.

- Employ strategies to manage wildland fires that provide for firefighter and public safety, minimize cost and resource damage, and are consistent with values to be protected, while maximizing overall benefits of wildland fire within the framework of land use objectives and resources management plans. Restore and rehabilitate resources and improvements lost in or damaged by fire or suppression activities.

- Promote public understanding of fire management programs and objectives, while preventing unplanned human-caused ignitions. Encourage research to advance understanding of fire behavior, effects, ecology, and management.

- Consider the use of prescribed fires to restore the historic scene and reduce hazardous fuels at Rancho de las Cabras.

- Organize a fire staff that can apply the highest standards of professional and technical expertise, and provide interagency assistance on a national scale through the Incident Command System.

C. Wildland Fire Management Options

1) Wildland Fire Suppression

Open fires are not allowed within the City of San Antonio due to air quality regulations, so all wildland fires that occur at the missions will be suppressed by

the city's structural fire department. Fuel treatments for hazard reduction or cultural scene maintenance will require chemical and/or mechanical manipulation. Rancho de las Cabras is in the response zone of the Floresville Volunteer Fire Department. The department currently conducts suppression actions on the Rancho without a Memorandum of Understanding, due to risk to adjacent lands. The park is in the process of finalizing a Memorandum of Understanding with the Floresville Volunteer Fire Department. An emphasis will be placed in educating the Floresville VFD on the importance of the cultural resources present at the Rancho. In the case of a fire, the VFD will contact the Chief Ranger who in turn will contact the appropriate park staff. Due to the response time for San Antonio Missions personnel, initial attack will either be successful before NPS personnel arrive, or suppression actions will have moved off the rancho.

2) Prescribed Fire

Initiating a prescribed burn program will be considered at Rancho de las Cabras as part of the development of visitor facitities and services expected to begin in 2009. Prescribed fire would be used to restore the cultural landscape and to prevent the invasion of exotics from neighboring lands. An amendment to this Fire Management Plan will be required before a prescribed fire component is initiated.

3) Wildland Fire Use

Due to urban characteristics of the missions area, and the size of the 'rancho' unit, Fire Use is not applicable.

4) Non-Fire Applications

Chemical and mechanical treatments will be utilized at the missions and Rancho de las Cabras to control hazardous fuels and achieve resource management goals. Acceptable mechanical treatments include chainsaws and mowers, other types of mechanical treatments will be approved by the resource advisor on an as needed basis.

D. Description of Fire Management Units

San Antonio Missions NHP contains four Spanish missions and associated structures representing over 300 years of southwestern cultural development. Spanish exploration began in the late 17th century, culminating with present day San Antonio, the ninth largest city in the United States. The park is a complex mix of ownership including: the National Park Service, the Catholic Archdiocese of San Antonio, the State of Texas, the City of San Antonio, the San Antonio River Authority, and numerous private individuals. The National Park Service owns roughly 30% of the park in fee simple and manages another 50% of the land via cooperative agreements.

The park is composed of several non-contiguous units. The park's approximately 826 acres are located along the San Antonio River, as it flows through the southern half of the city of San Antonio in Bexar County, Texas; and as it flows adjacent to the 99-acre Rancho de las Cabras site in Wilson County, Texas. This latter area was transferred

from the State of Texas to the National Park Service in 1995, and became part of the San Antonio Missions National Historical Park. This site is approximately 30 miles southeast of downtown San Antonio near the town of Floresville, Texas.

The four missions, Mission Nuestra Señora de la Purisima Concepción de Acuña, Mission San José y San Miguel de Aguayo, Mission San Juan Capistrano, and Mission San Francisco de la Espada lie along the San Antonio River and are within the political boundaries of the City of San Antonio. Each contains several stone structures and developed landscape. Rancho de las Cabras contains the buried ruins of Rancho buildings and a chapel.

The missions, and associated lands within San Antonio, are a grouped into the Mission FMU.

NAME	SIZE (rounded acres)
Mission Concepción	33 (0.6 NPS)
Mission San José	43 (6 NPS)
Missions Espada & San Juan	754 (375 NPS)
Rancho FMU	
Rancho de las Cabras, near Floresville	99 (99 NPS)

1) *Mission Fire Management Unit*

a) Natural and Cultural Resources

Archeology

The Missions FMU contains four primary archaeological sites of national significance: Mission San José y San Miguel de Aguayo, Mission Nuestra Señora de la Purísma Concepción de Acuña, Mission San Juan Capistrano, and Mission San Francisco de la Espada. Other archeological sites include features associated with the missions themselves (acequias, dams, aqueducts, and labores) and features associated with the later 19th century and early 20th century community development.

Mission San José was extensively restored and reconstructed in the 1930s. This mission and surrounding lands became part of San Antonio Missions National Historical Park in 1978. There has been a number of archeological projects conducted prior to infrastructure development and stabilization work. These investigations have indicated a fair amount of undisturbed Colonial period deposits inside and immediately outside of the compound walls. A thorough survey and assessment of the entire site has not been conducted. This unit is the most developed site of the four missions, and is surrounded by residential and commercial development.

Mission Concepción was designated as a National Historic Landmark on April 15, 1970. While there has not been a thorough survey and assessment of the entire site, archeological investigations have indicated that there are remnants of the compound walls and other architecture that survive beneath the ground surface. This unit comprises the northernmost mission in the park and is surrounded by urban/residential development and moderate industry. The church and convento are made of stone along with the several secondary structures and are at little risk from wildland fire.

Mission San Juan has probably had the most extensive archaeological investigations of all of the missions within the park boundaries. While a large amount of excavation has been conducted, a systematic survey and assessment has not taken place. Fallow farm fields that support grassy fuels and brush surround the mission.

Mission Espada is surrounded by maintained farmland and Loop 410. A hardwood shrublands/riparian area with significant semi-buried archeological resources (Spanish Colonial lime kilns) is north of the mission. A small number of excavations have been conducted due to restoration and maintenance efforts, but no systematic survey and assessment has been conducted.

Other archeological and cultural resources within the park include the Espada Aqueduct and acequia and Espada Dam (41BX280) that still conducts water to the original Espada farmlands. The San Juan acequia does not have water running in it, but is being repaired. Its associated dam (41BX266) is overgrown with brush and silt. Portions of the labores of Missions San Juan and Espada are within the park, and some are currently in use as agricultural lands. The acequias border the San Antonio River, and have been developed as an urban park with drives, picnic sites, hike/bike trails, etc. The river has been completely channelized but a remnant portion of the original river channel exists within the boundaries at Mission San Juan.

A series of archeological sites and historic structures associated with the Mission Parkway historic district are within park boundaries. These sites are all on the National Register as part of the historic district, and are the most threatened archeological resources in the park. Some of these sites were not well recorded in the original survey, and may have been modified or destroyed.

Climate

San Antonio's climate is typical for the South Texas/trans Gulf Coast area of the United States. Summers are hot and humid with daytime highs exceeding 90F over 80% of the time and relative humidity frequently exceeding 75%. Winters are relatively mild with the average minimum temperature around 40F. Occasional southern shifts in the jet stream allow arctic air to drive temperatures well below freezing. Temperatures of 32F or below occur on an average of 21-days per year.

The first killing frost generally occurs in late November, and green-up is usually evident by mid to late February. San Antonio has 50% of the possible sunshine in the winter and more than 70% in the summer.

Precipitation is generally in the form of rainfall although trace levels of snowfall are not unusual in the winter; however, measurable snowfall occurs only once every four years. Precipitation is common throughout the year and averages 1 to 4 inches per month. Intense storms can bring these totals to over 10" per month. Tropical storms occasionally affect the San Antonio area as the Gulf of Mexico is only 140 miles away. The usual effect of such storms is heavy rainfall and the potential for tornadoes.

Topography

San Antonio Missions National Historical Park is situated near the base of the Edwards Plateau, adjacent to the Balcones Escarpment and Blackland Prairie, in an area classified as the Rio Grande (or Gulf Coast) Plain (U.S. Department of Agriculture, 1991). The plain consists of level prairie and undulating hills dissected by the San Antonio River and its tributaries. Elevations on the plain range from 450 to 700 feet above mean sea level (MSL), with a general slope to the southeast. Regional topography is primarily influenced by the Balcones Escarpment; a broad area of faulted limestone that forms the southwestern edge of the Edwards Plateau. The escarpment rises 1,000 feet above the prairie to the south and east, and reaches from Del Rio, Texas (160 miles to the west), through northern Bexar County, to Austin (70 miles to the northeast). The escarpment follows a northeast/southwest alignment through northern Bexar County (U.S. Air Force 1997b). The park is approximately 15-miles south of the Balcones Escarpment). Topography within the park is relatively flat.

SOIL

A thick sequence of sedimentary rocks and unconsolidated material ranging in age from the early Cretaceous to Quaternary underlies the San Antonio area (Barnes, 1974). The total thickness of this sequence ranges from approximately 4,500 to 5,500 feet. The surface geologic units overlie, in downward progression, the Marlbrook Marl, Pecan Gap Chalk, Buda Limestone and Del Rio Clay, which comprise the upper confining aquitard for the Edwards Aquifer. The Edwards Aquifer consists of three limestone formations and is the principal water supply source for the San Antonio area.

According to the USDA Natural Resource Conservation Service County Soil Surveys, at least nine soil types (NRCS Soil Survey – Bexar County, TX – Series 1962, No.12) occur on or proximal to the mission area. These include Lewisville (nearly level alluvial soil with silty clay, slow drainage, usually cultivated), Houstin Black terrace (upland level clayey soil, often cultivated or irrigated), San Antonio (undulating clay soil, very slow drainage, erosion potential is high, native vegetation or

cultivated), Webb (sandy loam, naturally well drained soil, cultivated or irrigated), Trinity (nearly level alluvial clayey soil, slow drainage, native vegetation and pasture), Karnes (calcareous loam found on flood plains, naturally well drained, cool season crops such as small grain), Patrick (occur as terraces along streams that drain limestone prairies, calcareous clay loam, shallow soil, cultivation yields less than other soils), Hilly Gravelly Land (Calcareous loamy alluvium making up knolls and narrow ridges, used as pits and quarries, roadbed material, native pasture, mesquite), and Frio (limey alluvial soil, riparian areas, poorly drained clay soil, erosion and flooding, pecans) series.

Mission Concepción, Mission San Juan, Mission Espada, and Espada Park lie within the Venus-Frio-Trinity Association which is characteristic of the river drainages in the area. This association consists of deep, calcareous soils and is found throughout the bottomlands and terraces.

Mission San José lies within the Lewisville-Houston Black association as it is further from the river. This association represents old alluvium, and includes deep calcareous soils that are somewhat more clayey than the Venus-Frio-Trinity Association.

WATER

The regional drainage pattern in Bexar County flows almost entirely to the south and southeast from the Balcones Escarpment. Bexar County is positioned over the Balcones and Luling fault zones. These fault zones are characterized by mostly east-northeast-striking, near-parallel, normal faults, although northwest-striking cross faults are present. The faulting has modified the local structure of the bedrock units and caused development of secondary porosity in some strata (U.S. Air Force, 1997d). This area is a primary recharge zone for the regional aquifer. Because of its high yield potential (highly porous materials), the Edwards Aquifer is easily susceptible to contamination in the recharge zone. Most of San Antonio Missions National Historical Park is located 15 to 20 miles southeast of the recharge zone.

The San Antonio River originates within the City of San Antonio, and has stream flows of 10 to 20 cubic feet per second during the summer months. Surface water quality in the San Antonio area is generally poor, as municipal and industrial discharges and urban runoff are the principal flow inputs (U.S. Air Force, 1997b). Major problems include depressed dissolved oxygen levels and high levels of fecal coliform, chloride, sulfate, and high nutrient concentrations. According to the San Antonio River Authority, monitoring data also show that the water contains high levels of herbicides, pesticides and total suspended solids. The velocity of the river is low due to channelization and instream flood control structures. The generally poor water quality results from treated municipal sewage effluent and surface runoff. During periods of reduced flow, the water consists predominately of treated municipal wastewater, which the river cannot assimilate efficiently.

FLORA

At the time of Spanish exploration the lands within this FMU were part of the riparian forest of the San Antonio River or the vast grassland prairie that covered much of the interior of the continent. The park is located in the northern area of the ecological region designated by Texas Parks and Wildlife as the South Texas Plains. Historically, these plains were once covered with open grasslands and a scattering of trees, except in the riparian valley woodlands, which were more extensive than today. The primary vegetation of the upland areas consisted of thorny brush with common names such as mesquite, huisache, spiny hackberry, agarito: and grasses such as little bluestem. The riparian woodlands, including the San Antonio River, were dominated by vegetation such as pecans, sugar hackberry, cedar elm, mustang grape, rough-leaf dogwood; and grasses such as sea-oats.

However, 300 years of continuous modification by man has largely eliminated much of the native plant communities. Most of the missions FMU has been altered or developed during construction related to structures, streets, flood control and agricultural activities. The immediate grounds at all four missions have been heavily landscaped, and are best described as manicured Bermuda grass with some invasive grasses and forbs (primarily the Graminae family). On the more outlying grounds the bunch grasses tend to dominate. The overstory is sparse, and consists of generally isolated individuals. These include native trees (willows, cottonwoods, walnuts, elms, oaks, pecan, and mesquite) and ornamentals (chinaberry, privet, crepe myrtle and palm).

Non-native grasses, and other exotic species dominate much of the park due to seeding from external exotic species, fire suppression activities, overgrazing, farmland abandonment, and urbanization. Remaining native vegetation is in relatively mature stands that represent pre-development species in the general area. A complete list of the flora, including exotic species, is in appendix X.

FAUNA

The park is a transitional zone where the South Texas Brushland habitat, Post Oak Savannahs, Blackland Prairie, and Texas Hill Country habitats merge. Except for birds and fish (in progress), inventories for vertebrate species were completed in 2003. No inventory of invetebrates has been done. Appendix D presents the lists of species in the park.

THREATENED AND ENDANGERED SPECIES OF CONCERN

Flora and Fauna inventories that were conducted from 2001 to present have not detected any federally-listed threatened or endangered species. See the appendix for species that may occur in the area.

EXOTIC SPECIES

A variety of exotic floral and fauna species have been documented in the park, including:

Trees -	Chinaberry (Melia azedarach)
	Wax-leaf Privet (Ligustrum quihoui)
	Tree of Heaven (Ailanthus altimissima)
	Chinese tallow tree (Sapium sebiferum)
	Russian Olive (Eleagnus angustifolia)
Reeds -	Giant Reed (Arundo donax)
Grasses -	Bermuda Grass (Cynodon dactylon)
	King Rancho Bluestem (Bothriochloa ischaemum)
	Johnsongrass (Sorghum halapense)
Insects -	Red Imported Fire Ants (Solenopsis invicta)
	Africanized Honey Bees (Apis mellifera scutellata);
Birds -	Rock Doves (Columba livia)
	European Starlings (sturnus vulgaris)
	House Sparrows (passer domesticus)
Clams -	Asian Clam (Corbicula fluminea)
Fish -	Blue Tilapia (Tilapia aurea)
Feral -	Cats, dogs, and pigs.

The park initiated a chemical and mechanical treatment program to control Chinaberry, Wax Leafed Privet, and Giant Reed. The park has an Integrated Pest Management Program to control Imported Fire Ants and Africanized Honey Bees.

b) Objectives

- All unplanned and unwanted wildland fires are contained during initial attack (24 hours).
- Hazardous fuels adjacent to historic structures are treated annually to reduce threat to structures.
- 30% of cultural landscapes are maintained by annual fuel treatments (including mowing)

c) Management Constraints

San Antonio city regulations prohibit any broadcast burning. Debris burning is allowed under permit, but requires pits to be dug.

As a city ordinance prevents the use of planned ignitions in this unit unless an exemption is granted. Intensive manual reduction will be needed to achieve resource management goals.

Most of the lands within the park are not federally owned, and are managed under cooperative agreements. The cooperative agreements are currently being updated and an addendum regarding responsibilities in the event of a fire will be included. Much of the area within the park boundaries that has a significant urban-wildland interface is managed through easements rather than cooperative agreements. A total of XXX acres of easements exist in this interface area. The goals and objectives of the landowners in how they manage their land adjacent to the easement may conflict with wildland fire management strategies and tactics.

Each unit of the park is relatively small and wildland fires exit or enter the park quickly. The small size also limits the ability to effectively utilize planned ignitions to eliminate exotics.

The San Antonio Fire Department is not trained in wildland fire management. This could cause confusion, miscommunication, duplicate efforts, damage cultural resources, and potentially hamper joint operations with local land management agencies. Therefore, we will develop an agreement with the San Antonio Fire Department (SAFD) to educate them on the cultural values at San Antonio Missions NHP. The SAFD and NPS will agree to send an NPS resource advisor to any fire that occurs within park boundaries. The SAFD will immediately call the NPS if notified of a fire dispatch on NPS lands. SAFD will contact the NPS resource advisor if there is a fire adjacent to the park boundary that has the potential to spread to NPS lands.

d) Fire History

Prior to the establishment of the Missions this area was mostly open savannahs bisected by riparian woodlands. Natural fires (caused by lightning maintained the savannahs. In the 1700's European settlement began to occur and fire became a less active ingredient in maintaining the landscape. The early stages of the Texas cattle industry started and relatively intense agricultural practices began. The open savannah landscape remained throughout most of the period.

The 1800's brought about the decline and disappearance of the Mission communities. The area became urbanized and a more aggressive fire suppression philosophy took over. This caused the demise of the savannahs by the end of the century. Fire was used to occasionally burn agricultural fields but was not allowed any other role.

In the 1900's fire's role was completely eliminated except for the increasingly rare agricultural burn. Overgrazing, agricultural conversion, pavement, and escaped ornamentals dominated the vegetative scene, leaving little semblance of the mission era.

Except for our general knowledge of wildland fire activity throughout the South Texas area, nothing is known of specific fire history prior to park establishment. Today, open burning is a common (although generally illegal) practice on neighboring lands, and it is logical to assume that man caused fires occurred throughout the 20th century. While these were not recorded, many of the remaining trees show evidence of fire scars.

This is an urban park with a complex fuel structure connecting many of the vegetation types to the urban interface mosaic. Historically, vegetation in fallow fields, consisting of high weeds and small brush, has been controlled through routine mechanical manipulation in the form of disking. Riparian areas adjacent to the Espada and San Juan acequia systems are cleared annually by the 'ditchmaster'.

The park's FIREPRO normal year is 0 ignitions. The only fire recorded is the Bouchard Fire (January 1989) that burned 0.5 acres. Anecdotal comments indicate that the number of ignitions has been considerably under reported.

e) Fire Management Situation

1) Historical Weather Analysis

Thunderstorms can occur at any time throughout the year although they are most common April through September. Dry lightning is a rare occurrence and is not an important factor to the wildland fire management program. Humidity averages about 80% in the early morning during most of the year but drops to about 50% in the late afternoon.

2) Fire Season

This area of Texas can exhibit extreme fire behavior during July and August, which typically are the two driest and hottest months. Wildfire potential is also high during late winter when grasses are cured, but does not included drought factors.

3) Fuel Characteristics

Mission Concepción

The primary fuel is close-cropped Bermuda grass around the church with widely scattered palm, pecan, live oak, anacua, and ornamentals. Under worst conditions a slow, creeping ground fire (NFFL model 1) is the only likely threat in the developed part of this FMU. Recreational fields along the western side (about six acres) have significantly higher fuel loading resulting from

invading graminoids, and a scattered but growing brush/vine complex that could support a intense wind driven fire (NFFL model 2).

Mission San José

The primary fuel is close-cropped Bermuda grass, with a widely scattered sub-climax overstory of palm, pecan, live oak, anacua, and ornimentals. The trees are most prevalent along the north and east boundaries where visual screening lines have been maintained. Under worst case conditions, a slow creeping ground fire (NFFL model 1) would occur.

Missions Espada and San Juan

The fuels on both sides of the river reflect NFFL model 1. Fuels within the compound of both missions are similar to Mission San José. Lands surrounding the northern part of the unit are suburban, and become increasingly rural further south. Fuels outside the river bottom are predominately NFFL model 5. In some cases, fuel loads exceeds the normal six tons/acre but the live fuel component prevents using model 6.

The rapidly developing mid-story (NFFL Model 5) in the Espada area has the potential for more aggressive fire behavior, especially during drought or surface winds over 5-6 mph. Fuel loads are higher than normally associated with this model due to occasional jackpots of trash and illegally dumped cuttings.

4) Fire Regime Alteration

Natural fuels in the Missions FMU have been intentionally altered by over two centuries of farming and development. It is currently in Condition Class 3 (high departure from historical or natural range of variability), with a Fire Regime Class of II (Shrub lands: frequent, stand replacing fire regime). There is no intent to return this area to natural conditions.

5) Control Problems

Significant urban-interface occurs along the boundaries of Acequia Park, Acequia de San Juan, Mission Epada, and associated labores (farm fields). Fires in wildland fuels could present significant risks to surrounding homes/industry. Adjacent landowners also have significant fuel loads that threaten park resources.

6) Value at Risk and Urban Interface

This is an urban park with increasing development on adjacent and surrounding lands [Stinson Airport, AGE Refinery, Brooks City base, roads & highways, railroads, subdivisions and associated infrastructure].

2) *Rancho FMU - Rancho de las Cabras*

This historic Rancho is the only unit completed owned by the NPS, and is located near Floresville approximately 30 miles south of San Antonio (Wilson County). As the Rancho for Mission Espada, Rancho de las Cabras was an integral part of the mission's social and economic life. The unit was intensively farmed from the early 1700s, until the 1980's when it was allowed to go fallow. The unit has several pits from gravel and stone mining.

a) Natural and Cultural Resources

Archeological Resources

Rancho de las Cabras is the Rancho that supported Mission Espada. In 1991 the boundaries of San Antonio Missions National Historical Park were expanded to include other mission-related features including Rancho de las Cabras. In 1995 negotiations were complete and the 99.152 acres were transferred to the National Park Service. Extensive archaeological investigations were conducted on the ruins from 1980-1984. The ruins were buried in sand after these excavations. An additional archeological survey was conducted for the Cultural Landscape Report completed in 1998. A complete survey and assessment has not yet been completed. The area was used for cattle grazing for the majority of its history.

Rancho de las Cabras has a complete compound including for walls with rooms and a chapel.

Climate

The Rancho's climate is similar to San Antonio's climate (see Mission FMU).

Topography

The ruins are located on a prominent uplands terrace overlooking the San Antonio River valley and the confluence of Picose Creek and the San Antonio River. Several terraces slope down to the river's floodplain. Historic gravel pits are scattered on the terraces. The elevation ranges from 320 to 420 feet above sea level.

Soils

Soils at Rancho de las Cabras consists of the upland Eufaula Association characterized by deep fine sands with loamy subsoil. At least 4 soil types occur at Rancho de Las Cabras (NRCS Soil Survey – Wilson County, TX, 1977). These include Aransus (firm clay terrace or bottomland soil, cultivated, poorly drained), Colibro Sandy Clay Loam (calcareous sandy clay on gently sloping uplands, range, moderate soil erosion), Saspamco Fine Sandy Loam (on breaks from terraces to uplands, range and improved pasture land), and Frio (see Mission FMU).

Water

This area is downstream of San Antonio along the San Antonio River. A perennial creek, Picosa, flows across the site into the river. The bottomlands are frequently flooded.

Flora

This FMU is located in the South Texas Plains. The primary vegetation of the upland areas consists of thorny brush with common names such as mesquite, huisache, spiny hackberry, agarito, and grasses such as little bluestem. The riparian woodlands have not been significantly altered, and are dominated by live oak, cottonwood, sugar hackberry, and cedar elm. The ground cover is native bunch grasses, with a dense midstory of virginia creeper, honeysuckle, grape, and poison ivy. See Appendix D for plant list.

Fauna

The fauna is similar to the species listed in appendix D for the Missions FMU.

Threatened and Endangered Species

Flora and Fauna inventories that were conducted from 2001 to present have not detected any federally-listed threatened or endangered species. The state listed (threatened) Texas Tortise has been observed. See the appendix for species that may occur in the area.

Exotic Species

Rancho has many fewer exotic species than the Missions FMU. There The same exotic flora and fauna species occur but with much less frequency. There is virtually no privet or chinaberry and very few cats or dogs. Cattle do trespass occasionally from the neightboring ranchlands.

b) Objectives

1) Ninety five percent (95%) or higher of all unplanned and unwanted wildland fires are controlled during initial attack (24 hours or 99 acres).

2) Maintain monthly mowing schedule around the ruins.

c) Management Constraints

Fire management activities must consider urban interface issues: a buried petroleum pipeline, a major power transmission line, and adjacent private cattle grazing and dairy operations

The foundation of the ranch buildings and chapel were buried for protection, and should not be disturbed by fire management activities.

The Floresville Volunteer Fire Department is not trained in wildland fire management activities. This may cause confusion, miscommunication, duplicate efforts, damage cultural resources, and hampers joint operations with local land management agencies.

d) Fire History

While no fire records exist, historic land use practices were probably similar to those of the missions area. Agricultural burning probably occurred more recently, due to the rural setting, while suppression of wildland fires has allowed significant brush invasion and loss of grass.

While natural fires have been suppressed, field burning has been an integral part of agricultural practices in this area. As the area was added to San Antonio Missions NHP in 1995, no historical wildland fire occurrence records are available.

e) Fire Management Situation

1) Historical Weather Analysis

This area is within the general weather pattern for San Antonio, and has weather similar to the Missions FMU.

2) Fire Season

See Missions FMU

3) Fuel Characteristics

Fuels consist of Coastal Bermuda/fescue combined with graminae (primarily black grama), a mesquite midstory, and pecan/live oak overstory. The fuels are described as a intermix of NFFL model 2 (knee high grass open tree overstory) and fuel model 5 due to the 10' high mesquite brush on the upland terraces. The floodplain and riparian areas have a denser

canopy and light understory, fuel model 9. A ground cover of leaves and sparse grass is generally moist, and is occassionally flooded.

4) Fire Regime Alteration

Natural fuels in the Rancho FMU have been intentionally altered by over two centuries of farming and development. It is currently in Condition Class 3 (high departure from historical or natural range of variability), with a Fire Regime Class of II (Shrub lands: frequent, stand replacing fire regime). The park intends to return this area to conditions typical of the Spanish colonial period.

5) Control Problems

The site has generally rolling topography with terraces and steep banks down to the San Antonio River. Surrounding agricultural lands rotate through cultivation phases. When fallow a significant volume of grass occurs.

The site is fenced (barbed wire) on three sides, with the only access through a locked gate. The San Antonio River is the eastern boundary. A section of the FMU has vehicle access only across private land.

6) Values at Risk and Urban Interface

The town of Floresville (est. population 5000) is 3 miles east of the rancho, with scattered rural residences within 1 mile on Hwy 97 and CR 144. An industrial dairy is adjacent to the southern boundary.

IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

A. General Implementation Procedures

The Park will use a combination of fire management strategies to accomplish resource management and wildland fire objectives.

- Consider mechanical & chemical treatments, and planned ignitions at the Rancho de las Cabras unit to remove activity fuels or hazardous fuel loads. General development plans are completed, and visitor facility construction is scheduled for 2009. Prescribed burning would not begin until after the construction.

- Utilize manual reduction of fuels in the Missions FMU to restore the historic scene, and reduce fuel loads to an acceptable level of risk.

- Utilize an appropriate management response, based upon values at risk and maximum efficiencies, for all unplanned ignitions.

- Develop a fire history for the park, and utilize this information to revise this plan. A critical part of this study will be identifying, and protecting, "witness" trees to preserve their dendrochronological record.

- Develop cooperative agreements with the San Antonio Fire and Floresville Fire Departments to utilize existing resources, coordinate suppression responses, and assure overall cost efficiencies.

Defining Implementation Procedures

Wildland fires will be suppressed by the fire department having jurisdiction, utilizing the procedures developed by that organization for planning and iImplementation. San Antonio Missions will provide a resource advisor as a liason between park management staff and the fire department. The NPS will work with the fire departments to educate them on park resource values, to decrease the likelihood of damage to park features and value. The resource advisor acts as the superintendent's representative and will provide information an values at risk.

B. Wildland Fire Suppression

1) Fire Behavior

Missions FMU

Large areas of mowed lawn surround each mission. Irrigation through pop-up sprinklers during the summer keeps the grass green and reduces fire risk significantly. It cures during the fall, and could carry a low intensity fire during the winter. Mechanical treatment of brushy fuels, near the acequia's, has built up a duff layer that can carry a creeping ground fire. Untreated brush areas have the potential for higher intensity fire, due to the volume of fuel. However, surface fuels are generally too light to preheat the brush. A light intensity fire should move under the brush with a low rate of spread. Frequent floods transport some of the fuels out of the area. Soils are generally moist near the river, which increases the fuel moisture of surface fuels by wicking.

Rancho FMU

Remnant grasses and invasive brush can produce a high intensity - high rate of spread fire that will be difficult to suppress with even moderate winds. Dense stands of brush will produce long range firebrands that will easily cause spot fires on adjacent lands and across the San Antonio River.

2) Preparedness Actions

a) Prevention activities

The main objectives of the fire prevention program, is to reduce the threat of human caused fires through visitor and employee education. This can be accomplished by integrating the prevention message into

interpretive programs. As the fire danger increases, Park personnel will be advised of the danger and incorporate fire observation in the daily routine. Fire detection will generally be through routine patrols and activities of the park staff. Increased patrols and awareness will be implemented during very high to extreme fire danger periods. A project to communicate Firewise Landscaping to adjacent homeowners was completed in 2003, and provides Urban Interface information to other landowners.

b) Training

All employees working on any fire assignment will be qualified for the position assigned according to the National Wildland Fire Qualification System. All fire personnel will meet physical fitness standards required by RM-18. Supervisors will encourage employee participation in fire management activities, and develop training plans. Fire personnel will perform the physical fitness test (conducted by the Physical Fitness Coordinator) and attend 8-hour safety refresher training, prior to assuming any fire suppression duties on a calendar year basis. The Big Thicket National Preserve's Fire Program Assistant will update fire training and fire experience records annually.

c) Readiness

The park depends upon the City or San Antonio and Floresville Volunteer Fire Departments to suppress wildland fires. The park will establish contact with these departments when fire danger rises to the very high or extreme levels.

d) Fire weather and fire danger

The closest National Fire Danger Rating System (NFDRS) weather station is located at Lyndon B. Johnson NHP (#417901, BIRD). Although it is 60 miles north of the missions, the fuels and weather conditions are generally similar and it meets the park's needs.

There is also a weather station located at Stinson Airport, approximately 0.5 miles from Mission San Juan. The park does not currently have arrangements to use data from this station but a cooperative agreement could be worked out if necessary to have more detailed weather conditions than would be possible from the station located at Lyndon B. Johnson NHP.

e) Staffing Plan

This plan provides management with a sequence of increased staffing and equipment preparedness levels due to escalating fire severity conditions. It will utilize the Burning Index (BI) computed at the weather station operated by Lyndon B. Johnson NHP.

Staffing Class	Burning Index	Fire Danger

I	0 – 10	Low
II	10 – 18	Moderate
III	19 – 36	High
IV	37 – 40	Very High
V	41 +	Extreme

Each level includes the preceding levels actions.

Staffing Level I BI 0<10

Action: Routine park operations and staffing levels, maintenance of equipment, and staff training. Initial attack will be initiated by local fire departments with a park staff as resource advisor.

Staffing Level II BI 11 - 18

Action: Regularly scheduled patrols and prevention activities.

Staffing level III BI 19 - 36

Action: All qualified personnel are fully equipped; at least one FFT2 (or better) is on duty during normal operating hours. The Texas Interagency Coordination Center is contacted weekly with personnel availability. NOTE: this level may also be activated if the regional preparedness level III is declared.

Staffing Level IV BI 37 - 40

Action: On-duty firefighters have personal protective equipment with them; additional firefighters are available on an as-needed basis. Firefighters may be placed on duty in the Espada and Rancho de las Cabras areas, with extended workdays for fire personnel at the discretion of management. Daily updates will be provided to zone dispatch. This level may be activated if the regional preparedness level IV is declared, or if (3) or more arson ignitions per week are occurring. Fire prevention messages may be distributed to local media.

Staffing Level V BI >41

Action: Extended patrol hours are initiated for red-carded staff, smoking and open fires may be prohibited, and the superintendent may close areas to the public. Additional personnel and equipment may be requested from other areas, and engine patrols initiated in the Missions FMU and Rancho de las Cabras FMU. This level may be activated if regional preparedness level V is declared, or if arson/accidental starts are occurring daily.

3) Pre-attack plan

San Antonio is the ninth largest city in America, and has a fire department typical of a large municipality. The San Antonio City Fire Department provides full coverage (24 hours a day, 365 days per year) and has structural and wildland fire suppression capabilities (although it doesn't have a wildland fire management program). Floresville is a small community with a volunteer fire department. Response times and amounts will vary between 15 minutes (daytime) to 30 minutes (night); and a single brush truck (Monday to Friday - daytime) to several engines and a tanker (nights and weekends).

The San Antonio Fire Department and Floresville VFD maintain extensive resources, and due to the relatively small staff and acreage managed by the NPS, it is very unlikely that additional support would be needed. Due to the abundance of water and engine availability, and the damage handlines cause cultural resources, the preferred tactic will be rolling engine attack from established roadways or engine supported hose lays. A park resource advisor will be assigned to interface with the fire departments command structure. Park staff will work with the SAFD and the Floresville VFD to educate their departments about cultural resources in the park that could be damaged and ways to minimize that damage.

4) Initial Attack

Fire suppression actions will be taken to minimize resource damage and suppression costs. Actions will also be commensurate with values at risk and firefighter safety. All NPS fire personnel will comply with personal qualification and protective equipment standards identified by the NWCG. If initial attack, begun by NPS firefighters, is unsuccessful (i.e. crosses onto adjacent lands) the appropriate fire depatment (San Antonio FD or Floresville VFD) and Texas Forest Service will be notified, and command transitioned after a situational briefing. The San Antonio and Floresville Fire Departments will respond at a level identified in their own operational guidelines. San Antonio and Floresville fire department personnel will utilize their issued fire protective gear, and function in positions identified in their qualifications system. The Chief Ranger should designate a resource advisor to function as a liaison with the fire departments. The construction of handlines will require case-by-case approval by the superintendent and on-site guidance by a trained archaeologist or their representative.

Local fire departments and the Texas Forest Service have historically suppressed wildland fires on initial attack. Additional resources are not ordered, camped, rested & recooperated, etc.

Mission FMU

The structures are typically surrounded by adequate fuel breaks and defensible space. A confinement strategy is not practical due to the urban setting. Low-level use of aircraft is not permitted over the Missions FMU due to urban setting and possible conflict with the Stinson Airport traffic pattern. The appropriate tactic is to utilize direct attack with hose lays from supporting engines to avoid disturbance to archaeological sites. Hydraulic digging should be avoided to prevent disturbance to archeological sites.

Since the park's inception, there have been few uncontrolled fires in this area of the park. Most of the boundary is considered urban interface due to adjoining private residences and some commercial structures. Limited chemical and mechanical fuel treatments have been accomplished. Numerous man made control lines are readily available and there is a municipal water supply (hydrants at each mission) and abundant water in the San Antonio River to support engine operations.

San Antonio River Authority (SARA) and San Antonio Parks and Recreation (SAPR) own land adjacent to the park. Dialogues have been initiated for cooperative efforts to remove exotic vegetation, restore native vegetation, and acequia upkeep.

Rancho FMU

A confinement strategy is not practical as there is only one natural barrier, the San Antonio River, with brushy fuels potentially allowing a high intensity fire to cross any of the three remaining sides. Construction of a barrier ahead of the fire could place the firefighters at significant risk, and a 'burning out' tactic is not typical of structural fire departments.

A 'rolling attack' with wildland style engines (i.e. brush trucks) from within the black (areas that the fire has passed through) is the appropriate tactic. Direct attack using hose lays from supporting engines should also be attempted as more equipment arrives. A foaming agent or surfactant can be used at a low percentage rate (<1%) to reduce water usage, aid penetration, and prevent rekindling. Hydraulic digging should be avoided to prevent disturbance to archeological sites. Heavy equipment should be excluded from within the park boundaries.

Aerial delivery of water by either Single-Engine-Air Tanker (SEAT) or helicopter is permitted. Foaming or surfactant agents are not allowed near the river. It is unlikely that aerial resources would be available within the time frames of initial attack, and extended attack will put the head of the fire outside the FMU.

Local fire departments and the Texas Forest Service have historically suppressed wildland fires on initial attack. Additional resources are not ordered, camped, rested & recooperated, etc.

5) Extended Attack

Extended attack fires will move off NPS lands, and will be suppressed by local fire departments and the Texas Forest Service. An NPS firefighter will function as resource advisor for the portion of the fire on NPS lands.

The San Antonio Fire Department has sufficient fire equipment and water supply to suppress any wildland fires within the Missions FMU on initial attack.

The Floresville VFD will be able to suppress most wildfire ignitions at the Rancho FMU if it does not occur during peak burning conditions, or during a drought period. Fires occurring during Very High or Extreme conditions will quickly move outside the FMU, becoming the responsibility of the Texas Forest Service, and additional resources (dozers and aerial support) will be needed to maintain initial attack. If nighttime recovery of relative humidity occurs, containment can be expected. If the fire is expected to burn throughout the night a Type II management team (organized overhead personnel) should be considered by the TFS. The fire departments and TFS have their own planning processes, which includes a Fire Situation Analysis. NPS staff should assist in preparation of the FSA if active burning continues on NPS land.

Minimum Impact Suppression Tactics is the policy for all fire management activities on NPS lands. Most wildland fires can be suppressed with water from a hoselay or rolling attack. The use of a foaming or surfactant agent is permitted away from any watercourse. Hydraulic digging with the water stream should be avoided. Construction of handlines will require consultation with an archeologist. Cold trailing the fire edge is preferred, with handtools and water used on heavy fuels (i.e. mop up stumps). All soil disturbances near buried ruins should be avoided. Heavy equipment can only be used on the boundaries of the Rancho FMU.

example of a "Delegation of Authority" for Incident Commander

Y14

1/23/99

To: Files

From: Superintendent

Subject: Delegation of Authority for Wildland Fire Management

The goal of this delegation is to expedite those decisions needed at the operations level, while retaining administrator oversight and preserving the 'checks and balances' of multi-agency involvement.

Wildland fires within the Missions FMU will require aggressive initial attack due to high-values-at-risk. The Rancho FMU has fewer urban interface issues, but greater fire behavior potential, allowing for a more calculated suppression response. Resource damage due to the suppression effort should be considered when selecting tactics. The NPS will provide a resource advisor to coordinate with the command team.

A Fire Situation Analysis will be completed by the resource management staff, Fire Management Officer, and Incident Commander when initial attack is not successful. The superintendent will retain initial approval; however, the Daily Review will be delegated to the Chief of Resources Management and Visitor Protection, with regular briefings to the superintendent. If fire conditions or complexity levels escalate, signature authority will automatically and immediately revert to the superintendent. If the review process dictates selection of a new management alternative, certification authority will also revert to the Superintendent.

Rehabilitation

Management actions allowed under this plan will not result in resource damages requiring significant rehabilitation. Mitigation actions include removal of suppression equipment (i.e.: hoses) and site cleanup of trash. Vegetative slash will be chipped or left on-site and tree stumps flush cut. Surface disturbances (scratch lines, vehicle ruts) will be raked in after inspection by an archaeologist. Extensive rehabilitation actions (seeding or repair to cultural resources) will require a written plan and approval by the Region BAER coordinator in Denver prior to implementation.

Records and Reports

The status of all wildland fires will be reported daily to the Texas Interagency Coordination Center [TICC] by a faxed ICS-209 form. It details the statistics [size, equipment, staffing, progress, etc.] and details current activities & potential in a short narrative. The cluster fire staff can assist in the submittal.

The park establishes an account code using the park Identifier (7600), followed by a unique national accounting code received from TICC (AA##), followed by an activity class (E11 for wildfires, E12 for prescribed burns). The IMR Fire Budget Analyst should be notified of the park, anticipated resource orders, and account number for cost tracking. All resources or charges assigned to this incident will use this account number.

A fire report (DI1202) should be initiated in the SACS system, then updated daily. This can be accomplished by calling the cluster fire program assistant, who will enter the data online. A paper copy of the fire report [including a narrative & map (GPS data is preferred)] should be completed and entered into the computer system within 10 days of calling the fire out. Fire reports for prescribed burns, and any escape, must be reported in the DI-1201 format on SACS. The park will maintain a file that includes the burn plan, fire report, fire narrative, cost, spread maps, observed weather and fire behavior data, fire monitoring data, any operational or injury review, and any other information that is pertinent. Any significant injury / accident, or escaped fire that has significant impact to adjacent lands, is large in size, or controversial should be reported by phone to the IMR FMO. The park will also maintain a fire atlas (GIS maps) as a historical record.

All entrapments or burn-overs should be reported immediately to the superintendent, and a review process initiated in consultation with Regional FMU. A prelimany report (ICS ###) should be prepared and faxed to the IMR fire office.

C. Wildland Fire Use

San Antonio Missions NHP does not have a wildland fire use program. Due to the Park's small acreage most fires will move out of the Park before a program could be implemented. All fires will be immediately suppressed.

D. Prescribed Fire

1) Planning and Documentation

a) Annual Activities

The park management team, resource staff, and collaborators will determine if prescribed fire treatments are necessary to restore and maintain a cultural landscape, and manage hazardous fuels, at Rancho de las Cabras. Projects will be defined, funded, and tracked in the National Fire Plan Operating and Reporting System (NFPORS) and Shared Application Computer System (SACS). Prescribed burn plans will meet RM-18 guidelines, go through an external review process, and be approved by the superintendent. Cluster fire monitoring staff will collect first order fire effects and pre/post burn data. Fire reports, burn narrative, maps, etc., will be submitted within the time frames required by RM-18 (see IV-B-9). If the park does some prescribed burns for hazardous fuels reduction, it will be done in an ecologically sound manner.

b) Long Term Strategy

Resource management staff will establish annual goals for specific areas and each treatment. General resource goals for the Rancho FMU are to eliminate Coastal Bermuda grass and other invaders from the grass complex, remove all of the brushy midstory, reduce the overstory by 75%, reduce the existing vegetative cover to less than 2.5 tons/acre (except along the river bottoms where heavy fuels are historically accurate), and prevent invasion of exotic plants from adjacent properties.

c) Personnel

The park does not have sufficient wildland fire risk, or fire history, to justify full-time fire positions. The park will, at a minimum, maintain a collateral duty Fire Management Officer qualified as an advanced firefighter [fft1], and two firefighters [fft2]. The South East Texas Cluster's Fire Management Officer, stationed at Big Thicket National Preserve, will provide oversight and assistance. Additional staffing for wildland fire management actions can be requested from Lyndon B. Johnson National Historical Park, Padre Island National Seashore, and other inter-agency partners.

d) Weather

Prescribed fires will be conducted when Staffing Levels are 1-3, and when no frontal passage or unusual weather event is expected within 24 hours. Generally, headfire ignition patterns will only be utilized during light winds (<5 mph). Specific weather and fire behavior parameters are defined in each prescribed burn plan to determine equipment and staffing needs while achieving resource goals. The Rancho FMU has too much variability in topography, fuels, and residual historic use patterns to support a statistically valid series of monitoring plots. A series of photopoints, and sampling along

established transect lines will provide documentation, species occurrence and frequency, and trend information.

Development of resource management goals for the Rancho is necessary before prescriptions can be prepared.

e) Critique of prescribed burn projects

An After-Action-Review will be conducted on-site, by the burn boss, at the end of each active fire period. While a group meeting is preferred, specific resources that are leaving the fire early may be debriefed individually. All participants will be given the opportunity to discuss equipment status, holding and ignition operations, observed fire behavior, safety issues, any remaining control needs, tomorrows operations, personnel issues, and other pertinent items.

f) Reporting and Documentation

The initiation, accomplishment, size, and cost of a fire management action are tracked on the NFPORS web page. A short description of the treatment and result, as a 'success story', is submitted to the Public Information Officer at the National Interagency Fire Center. Fire reports for prescribed burns follow the same procedures as wildfires, and any escape is entered on the fire report for the prescribed burn, and a separate fire report generated to document the escaped fire. The park file should include additional monitoring data, and accomplishments.

g) Historic fuel treatment map

This park was established specifically for its history of human development (building and agriculture) for over 250 years. These general patterns of typical activities are known, but no specific records of fire activity.

h) Prescribed burn plan

The cluster fire staff, in consultation with the park, will prepare prescribed burn plans. A sample of a prescribed burn plan that meets the requirements of RM-18 - chapter 10 is located in Appendix E.

2) Exceeding existing Prescribed Fire Burn Plan

A prescribed fire should be converted to a wildfire if weather conditions or fire behavior exceed prescription parameters, goals are not being met, or an escape occurs. The burn boss will make that decision based on the cumulative effects of the prescribed burn, chemical suppression, and the values at risk (cultural resources etc.). A Wildland Fire Situation Analysis should be prepared (see RM-18, chapter 9) to guide suppression efforts after initial attack. If the escaped fire has the potential to cross the boundary, or is on adjacent lands, the Floresville VFD will be notified. Trigger points are identified in the transition section of the prescribed burn plan.

3) Air Quality and Smoke Management

Missions FMU

The park is in Texas Air Pollution Control District 217, Region XIII, one of the sixteen air quality districts in Texas. Bexar County is in attainment for all criteria pollutants. The regulatory authority is the TCEQ, Air Quality Division. Bexar County is one of many counties for which the EPA has revoked the 1-hour national ambient air quality standard for ground-level ozone. Although the 1-hour standard no longer applies in Bexar County, the new 8-hour standard does apply. San Antonio is a Class II area as it relates to the Clean Air Act.

The impact of air pollution on the park's mission structures, masonry, flora and fauna, has not been determined. An increase in acid rainfall could greatly accelerate the deterioration of the sandstone and limestone rocks and cementing agents used in construction of the missions and related structures. Outdoor burning is prohibited within the city limits of San Antonio.

Rancho FMU

Areas surrounding the Rancho de las Cabras FMU are sparsely populated rural residences, agricultural lands, a industrial dairy, and the town of Floresville. Threshold atmospheric conditions are included in prescriptions to assure smoke dispersal. A computer model (SASEM) will be run prior to each burn to assure that dispersion is at least fair (or better), and that no air quality violations are predicted. The park will notify the Texas Commission on Environment Quality (Region 9) prior to any burn, and ignition activity will be limited to 0900-1600 hours.

Big Bend National Park, 400 miles west of San Antonio, is the closest Class 1 airshed. It will not be impacted by any fire activity as the prevailing winds are from the southeast, and the maximum smoke that could be produced off 99 acres would disperse before it reached Big Bend.

The San Antonio metropolitan area experiences ozone alerts, and occasional non-attainment days. San Antonio is a receptor for long-range transport of pollution from Mexico. Transport of smoke from agricultural burning in Central America during the spring can trigger health alerts. San Antonio city regulations do not permit open burning within the city, but may grant exemptions. Prescribed burns at Rancho de las Cabras (30 miles south) must not put a smoke plume into the city. Smoke plumes should also be directed away from Floresville (3 miles east) which has schools, hospitals, and the Promised Land Dairy that is 1 mile north on Hwy 97.

E. Non-Fire Fuel Treatment Applications

Fuel treatments at the Missions FMU are limited to chemical and mechanical actions. The park developed a mechanical treatment of brush near the acequia in consultation with the San Antonio River Authority (SARA), the San Antonio Water System (SAWS), and the 'Ditchmaster'. A contractor treated forty-four acres in FY2003. Park management staff will annually review the progress of restoration, and submit funding

request for additional contracts when appropriate. The park also completed a educational project (FY2003) on Firewise Landscaping to adjacent homeowners to reduced fuel continuity near structures.

General management plans for Rancho de las Cabras have been completed, and construction is scheduled for 2009. This information was taken from the Rancho de Las Cabras Cultural Landscape Report, November 1998. Under "Design Guidelines and Recommendations: Treatment Area 3: Mesquite Uplands" (p. 5-16) it describes the area as including the "western upland plateau surrounding the rancho compound…once open native grass prairie, has been utilized variously over the years as crop fields and grazing lands. It has been left fallow for approximately twenty years. The current vegetative community dominated by mesquite, appears to differ greatly from the open prairie that existed during the Spanish colonial period."

Goals

- Consider altering the existing upland vegetative community through vegetation management strategies, such as controlled burning, mechanical clearing, or other suitable methods, to reduce mesquite dominance; and
- Allow for minimal development of pedestrian and service circulation systems to provide access to the *rancho* compound and its environs.

Taking these goals into consideration, treatments can be considered and project funds requested.

1) Restrictions

Equipment use will not cause soil displacement within the FMU without an EA.

Disruptive actions to nesting birds will be minimized.

Public closures will be considered during the implementation process of any management activity.

2) *Monitoring*

Short term monitoring of brush re-growth and grass recovery will consist of photo-points and line-transect surveys to determine the effectiveness in meeting management objectives. Long-term monitoring will be planned in conjunction with the IMR Fire Effects Monitoring staff. Scientifically valid research may require contracted or university level assistance to accomplish.

3) Critiques

The resource management staff will determine if the initial treatment results meet the resource management goals, and conduct an on-site review with involved park staff and contractors. The review will include: determining if the scope of work was completed, discussion of any problems or issues, future treatment needs, expansion of the project to other areas, knowledge gained that can be incorporated into future projects, and any cost saving factors.

4) Accounting

The budget and accounting process of the park will approve and track expenditures. If NFPORS funds are used a summary will be sent to the IMR Budget Analysis.

5) Annual project list

The resource management staff will prepare annual project proposals in January, and coordinate funding input (NFPORS) with the cluster fire staff for funding during the next fiscal year.

F. Emergency Rehabilitation and Restoration

Approximately 30 percent of the Missions FMU has an urban park appearance, with the remainder in fallow historic agricultural fields [labores] that have wildland fuels. Wildfires will be suppressed with appropriate management response using Minimum-Impact-Suppression-Tactics, so no rehabilitation of control lines is expected. Removal of charred trees and brush should be considered to maintain the scene, and short-term irrigation used to restore a grass ground cover.

The Rancho FMU has a mowed area around the ruins, but does not have visitor use facilities. The area is closed to visitation, except for a guided tour scheduled monthly. Any control lines will be inspected by an archeologist, and will require rehabilitation to restore natural contours. Park staff should consider piling & burning of charred trees and brush, and short-term irrigation to restore a grass ground cover.

Additional rehabilitation and restoration actions are outside the blanket emergency authorization and will require the development of a plan that will be approved by IMR fire staff.

V. ORGANIZATIONAL AND BUDGETARY PARAMETERS

FIRE MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

The purpose of this section is to outline operational procedures and responsibilities necessary for the implementation of a wildfire suppression program. The Park is currently working on agreements with local volunteer fire departments for mutual aid response on adjacent lands (Appendix E). Prescribed fires will be planned and conducted with the assistance of personnel from Big Thicket National Preserve.

SUPERINTENDENT – Responsible for the overall program direction and periodic assessment. Has final decision-making authority for fire management operations. Approves Wildland Fire Situation Analyses, Delegations of Authority, and signs interagency agreements for the park.

The CHIEF DIVISION OF RESOURCE MANAGEMENT AND VISITOR PROTECTION is the designated Fire Management Officer (FMO) for the Park. The FMO is responsible for management oversight of the program on a daily basis, advising the Superintendent on significant activities, recommends policy and procedural changes as they relate to wildland fire

program. Serves as the chair of the fire management committee, directs all fire management and fuel reduction activities within the park, and functions as technical advisor.

The CHIEF OF PROFESSIONAL SERVICES provides liaison between the Division of Professional Services and the Fire Management Officer. Serves as primary resource for historic landscape maintenance, and is a member of the fire management committee.

The CHIEF RANGER coordinates fieldwork of mechanical and chemical fuel reduction projects. If a major unplanned ignition occurs, the Chief Ranger will prioritize suppression responses.

The CHIEF OF INTERPRETATION functions as the parks Public Information Officer.

The FMO, Big Thicket National Preserve, provides technical fire assistance and fire program guidance when needed, and is liaison between the Park, Region, and the Washington Office.

The FIRE MANAGEMENT COMMITTEE (established by the superintendent) supports management objectives by promoting and integrating the fire management program with other park programs. The committee reviews planned ignitions and manual reduction projects, assigns project priorities, assures park resources availability, and reviews completed projects for compliance with management objectives. During regional or national mobilizations, the committee the will determine resource availability (subject to visitor and resource protection needs), and coordinate activity with the Texas Interagency Coordination Center. The committee is responsible for the annual review and updating of this fire management plan.

A. FIREPRO Funding

Park staff will develop projects in consultation with the cluster FMO and fire ecologist. The projects will be entered into NFPORS for funding, with the cluster FMO functioning as the project's advocate during the budget process.

B. Organizational structure

All fire responsibilities are collateral duty for park staff.

C. Certifying fire use

Fire use is not part of the fire management program at San Antonio Missions.

D. Interagency coordination

The park cooperatively interfaces with several local, state and federal entities such as San Antonio River Authority (SARA), San Antonio Water System (SAWS), Texas Commission on Environmental Quality (TCEQ), Texas Forest Service, Texas Interagency Coordination Center, Texas Parks & Wildlife, US Fish and Wildlife Service, and the City of San Antonio.

E. Key interagency contacts

Dispatch availability	Texas Interagency Coordination Center
Fire status, project numbers	" "

Initial Attack at Missions FMU	San Antonio Fire Department
at Rancho FMUFloresville	Volunteer Fire Department
Extended Attack	Texas Forest Service

F. Agreements

The park intends to develop cooperative agreements with the San Antonio Fire Department and Floresville Volunteer Fire Department.

A draft interagency agreement between the US Forest Service, National Park Service, US Fish and Wildlife Service, Texas Nature Conservancy, is expected to be signed in 2004.

VI. MONITORING AND EVALUATION

Short term monitoring will consist of site inventories of planned ignitions or manual fuel reduction projects to determine the effectiveness in meeting management goals. Monitoring will be planned and conducted in conjunction with protocols established by the IMR Fire Effects Monitoring staff. Longer-term research needs are defined in the park's Resource Management Plan. These include developing a fire history for the park, and developing a comprehensive fauna inventory. These actions are beyond the ability of the park and will require regional or university level assistance to accomplish.

VII. FIRE RESEARCH

No fire research has occurred. The park will pursue a fire history project to research San Antonio Fire Department records to determine fire information and develop a GIS map.

VIII. PUBLIC SAFETY

The State of Texas and the City of San Antonio are currently working on a Mission Trails project to link the San Antonio River and the historic missions, city parks, and neighborhoods along its banks. The project includes street modifications, additions to the hike and bike trail system, public art, and increased city services.

The City of San Antonio owns and operates Stinson Airport, which is just west of Mission San Juan. Stinson is located on 300 acres of land bordered by Mission Road, Roosevelt Avenue, 99th Street and Ashley Road. The airport serves as a reliever for San Antonio International Airport, accommodating small-to-mid size propeller and jet-powered aircraft. The city is also proposing new facilities and increased usage of Stinson Airport.

Appropriate and compatible land uses within the park vary in relationship to existing land use, development patterns, cultural uses, and significant resource needs. It is an important precept of the area that private use of the historic structures for religious and community purposes continues. Although the historic farmlands (labores) connected with the missions are generally not being actively cultivated, agricultural uses associated with them are viewed as compatible.

Intense development of adjacent lands could have adverse impacts on the historic scene, visitor experience, and potential Federal or State Listed plants and animals. Brooks Air Force Base is monitoring a TCE plume and has initiated a cleanup of the contamination with oversight from the Texas Commission on Environment Quality (TCEQ, formerly TNRCC).

Mitigation of safety issues

The park will work closely with adjacent landowners to develop defensible boundaries, and limit the spread of wildland fires that threaten homes and businesses.

Planned ignitions will be scheduled in advance and neighbors notified prior to ignition. Commissioned rangers will be present during the burn(s) in order to direct traffic and control access to the site.

Safety is the top priority of any fire at San Antonio Missions. During any wildland fire activity access by public will be restricted, and tours of the Rancho may either be cancelled or rerouted.

Evacuation/Closure procedures

Mission FMU

Closure and evacuation of areas at risk will be implemented immediately upon notification of a wildfire. Evacuation of visitors will be the responsibility of the protection division with assistance from other divisions as required. The area will remain closed until the fire is extinguished. Due to the nature of the fuels and size of the missions, closures and evacuations will normally be of short duration. Routine operations should continue within hours. Maps of the roads and trails are included in Appendix I.

Rancho FMU

Closure of the area in the immediate vicinity of the fire will be determined by the IC or Burn Boss based upon wind speed and direction, smoke density, flame length, rate of spread, etc. Protection rangers will ensure that visitors and non-essential personnel are evacuated from the area.

IX. PUBLIC INFORMATION AND EDUCATION

The majority of ignitions in and around the park result from the careless use of fire during recreational activities. The park will incorporate fire prevention material into the school outreach program. Wildland fire related messages will be added to San Antonio Fire Department's prevention and education program. The use of agricultural burning is well understood locally, which provides a good base of support for using fire to manage cultural scenes. While fire's role in the mission era is not well documented it clearly had an impact. As brush reduction projects establishes grasses typical of the Spanish colonial period, displays will be added and incorporated into interpretive documents and programs.
If and when prescribed burning is begun at the Rancho FMU, the public will be made aware of the plan through public meetings and mailings to those land owners near the Rancho. All prescribed burns would be coordinated with the Floresville VFD and timing would also be coordinated with the Texas Forest Service.

The Texas Forest Service is the principal wildland fire suppression agency, and has fire weather and predictive services staff that provide fire danger warnings to local city and county officials. When Very High or Extreme fire danger levels are declared, the county judge restricts outdoor burning and a red 'Burning Ban' flag is flown from all Post Offices and City Halls. The TFS also has public information officers that interact with local media.

X. PROTECTION OF SENSITIVE RESOURCES

Special protection for Archeological/Cultural/Historic

Natural and cultural resources will be protected from the adverse effects of unwanted fire and fire management activities. Flame passage poses little risk to buried archeological sites, but they are vulnerable to disturbance by scraping firelines or heavy equipment. During all suppression activities, minimum impact suppression tactics [MIST] will be incorporated to the greatest extent feasible, and appropriate, employing methods least damaging to park resources for the situation. An EA will be developed if heavy equipment is to be used for post fire rehabilitation. The missions, kilns, and associated buildings are constructed of stone and have exposed wooden beams. High intensity fires may cause spalling, discoloration, and deterioration of the mortar.

Special treatment for natural resources

While there is potential to see threatened or endangered species in the park, there have been no sightings or nesting locations that would require special treatment. The acequias (water ditches) have elevated banks in some areas that should not be disturbed. The lawns around the missions are well maintained and provide adequate defensible space. Mechanical reduction of non-native vegetation around the kilns will reduce fire risk.

XI. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

IMR fire staff may conduct a fire program review on a 3 to 5 year cycle, or audit specific projects as needed. The park superintendent may also request or conduct a review. All entrapments, deployments, other serious incidents, or potentially serious incidents will be immediately investigated. Reviews will be conducted so as to provide constructive critiques not as a faultfinding process.

The Fire Management Officer will review the Fire Management Plan annually, and submit changes for the superintendent's approval and signature. Copies of the annual update/revisions will be sent to the Regional Fire Management Officer.

Fire management staff will conduct an annual Fire Readiness Review utilizing the Interagency Fire Readiness Review Guide adapted for the preserves specific needs. Participation by interagency partners will be requested.

Each wildland fire will have an 'After Action Review' conducted by the Incident Commander or Burn Boss, with recommendations added to the fire record. A formal critique of fires greater than 10 acres will be 'chaired' by the FMO, and documented in fire file.

Fire Reviews will be conducted in accordance with RM18:

Purpose of reviews:

- Examine progress of ongoing fires
- Identify new or improved techniques or tactics.
- Compile consistent and complete information to improve or refine park fire management programs and to ensure cost effectiveness of the program.
- Examine unusual fire related incidents

Hotline Reviews: Examine the progress of ongoing fire incident. Conducted by the Fire Management Officer or Superintendents designee with the Incident Commander. Provides for conformation of decisions made daily in the Wildland Fire Situation Analysis or determines faulty decision process and provides corrective action.

Park-level Reviews: The Superintendent or designated representative, the FMO plus other qualified personnel appointed by the Superintendent make up the review board. Provides the Superintendent with information to recognize commendable actions and to take corrective actions. A report generated from this review is forwarded to the Regional FMO.

Entrapment and Fire Shelter Deployment Review: Any entrapment or deployment will be reviewed as soon as possible after the incident and a report will be made to the Regional FMO.

XII. CONSULTATION AND COORDINATION

Dave McHugh, FMO, Big Thicket N PRES

Susan Snow, Archeologist, San Antonio Missions NHP

Greg Mitchell, Biologist, San Antonio Missions NHP

James B. Oliver, Landscape Architect, San Antonio Missions NHP

Dan Steed, Chief Ranger, San Antonio Mission NHP

Elizabeth Dupree, Chief of Interpretation, San Antonio Missions NHP

David Vekasy, Facility Manager, San Antonio Missions NHP

Rosalind Rock, Historian, San Antonio Missions NHP

Mike Johnson, Architect , San Antonio Missions NHP

Rich Arias, Special Projects Officer, San Antonio Missions NHP

Drew Gilmour, Law Enforcement Ranger/Fire Mgmt, Lyndon B. Johnson NHP

Mark A. Peterson, Texas Forest Service

Mike Duran, The Nature Conservancy

Cindy Wirz, Congressman Ciro D. Rodriguez

Roland Hinojosa, City Public Service

Tim O'Krongley, City of San Antonio – Stinson Airport

Dale Bransford, San Antonio River Authority

David Lugo, San Antonio Water System

David Ribble, Biologist, Trinity University

Monsignor Balthasar Janacek, Old Spanish Missions/Archdiocese

XIII. APPENDICES

A. References

U.S Department of the Interior. 1982. *General Management Plan/Development Plan*. San Antonio Missions National Historical Park, Southwest Regional Office, National Park Service.

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OCULUS. 1998. *Rancho De Las Cabras Cultural Landscape Report*. San Antonio Missions National Historical Park.

F.B. Taylor, R.B. Hailey, and D.L. Richmond, Soil Conservation Service. 1991. *Soil Survey, Bexar County Texas*. United States Department of Agriculture.

B. Definitions.

DEFINITIONS

Appropriate Management Action: Specific actions taken to implement a management strategy.

Appropriate Management Strategy: A plan or direction selected by agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Contain/Control: These terms are used to report the condition of the fire, and relate to fire time keeping, but do not have tactical meaning.

Fire Management Plan: A strategic plan that defines a program to manage wildland fires. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, burn plans, and prevention plans.

Initial Actions: Action taken by first resources to arrive at a wildland fire to meet protection and fire use objectives.

Planned ignition: A wildland fire ignited by management actions to meet specific objectives.

Preparedness: Activities that lead to a safe, efficient, and cost effective program in support of land management objectives through appropriate planning and coordination.

Prescription: Measurable criteria that guide selection of appropriate management strategies and actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social or legal considerations.

Suppression: A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Unplanned Ignition: A wildland fire not ignited by management actions.

Wildland: Any area under fire management jurisdiction of a land management agency.

Wildland fire: Any fire that occurs in the wildland.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, political, and economic criteria.

C. NEPA and NHPA Compliance

The actions proposed under this plan fall within the review requirements of the National Environmental Protection Act and the National Historic Preservation Act. San Antonio Missions National Historical Park is a full suppression park. Mechanical and chemical treatments for removal of hazardous fuels are covered by an EA prepared in 2000 for the exotic species removal program at the park. If the park later uses prescribed burning to control hazardous fuels, further NEPA compliance will be necessary.

The State Historic Preservation Officer for Texas has been consulted and concurred with the 2000 EA. They will also receive a copy of this approved plan. The resource management staff (and the NEPA interdisciplinary team) will review manual fuel reduction projects or planned ignitions and assessment of effect forms will be completed as needed.

United States Department of the Interior
NATIONAL PARK SERVICE

SAN ANTONIO MISSIONS NATIONAL HISTORICAL PARK
2202 Roosevelt Avenue
IN REPLY REFER TO: **San Antonio, Texas 78210**

Y14

February 19, 2004

Memorandum

To: Files, San Antonio Missions National Historical Park

From: Superintendent, San Antonio Missions National Historical Park

Subject: Environmental Assessment for Fire Management Plan

San Antonio Missions National Historical Park conducted an internal scoping meeting on May 5, 2003 to determine the issues and impact topics for a Fire Management Plan. The meeting included:

Elizabeth Dupree	SAAN Chief of Interpretation/ Acting Superintendent
Dan Steed	SAAN Chief Ranger
David Vekasy	SAAN Facility Manager
Susan Snow	SAAN Archeologist
James Oliver	SAAN Landscape Architect
Rosalind Rock	SAAN Historian
Mike Johnson	SAAN Architect/ Acting Chief of Professional Services
Rich Arias	SAAN Special Projects Officer
David McHugh	Big Thicket National Preserve Fire Management (Facilitator)
Drew Gilmour	Lyndon B. Johnson NHP Law Enforcement Ranger/Fire Mgmt
Mark A. Peterson	Texas Forest Service
Mike Duran	The Nature Conservancy
Cindy Wirz	Congressman Ciro D. Rodriguez
Roland Hinojosa	City Public Service
Tim O'Krongley	City of San Antonio – Stinson Airport
Dale Bransford	San Antonio River Authority
David Lugo	San Antonio Water System
David Ribble	Biologist, Trinity University
Monsignor Balthasar Janacek	Old Spanish Missions/Archdiocese

The meeting determined that wildland fires within the city of San Antonio have been, and will continue to be, suppressed by the city fire department. City regulations prevent 'open burning' [i.e. prescribed burns] and burning the 'labores' [i.e. historic farm fields] would impact the Stinson Airport flight pattern. Fire use is not practical due to the size, arrangement, and urban interface. As the NEPA process is used determine and document a decision from a range of alternatives, but suppression by the city fire department is the single alternative, no EA on fire treatments within the Missions Fire Management Unit will be prepared.

Wildland fires at Rancho de las Cabras, a 99-acre 'rancho' located outside the City of Floresville, TX, are suppressed by the Floresville Volunteer Fire Department. The park intends to initiate a prescribed burn program in 2009 to manage fuels for hazard reduction and resource management goals. As the intended life span of a fire management plan is 5 years, the compliance and procedures will be included in the next rewrite.

Chemical and mechanical treatments approved to control exotic Chinaberry and Wax Leaf Privet is also applicable to fuel management activities. NEPA compliance for these activities is covered under the EA/FONSI for Controlling Chinaberry and Waxleaf Privet [dated January 5th 2001]. The preferred alternative states, "mechanical, cultural, chemical and biological methods of control, each by themselves, were found to be inadequate to control the target species. Together, however, they form a reasonable strategy to accomplish the stated goals of this assessment.

A combination of methods including some mitigative measures such as erosion control, reforestation, and project maintenance make up the preferred Alternative."

Mechanical Controls include girdling of large trees to prevent seeding, the use of chainsaws and brush cutters to fell trees and seedlings, and chipping. The chips could be utilized instead of discarding. The use of heavy equipment such as chippers and trucks would be limited to prevent soil disturbance and compaction. The percentage of plants to be removed in a single year would vary. If the target species represented over 50% of the area, removal would be phased in over a period of years.

Chemical Controls include the use of herbicides as a stump treatment to prevent re-sprouting, and spot treatments of suckers and emerging seedlings. The park intends to use a formulation of glysophate [Roundup and Rodeo, registered names by Monsanto] for dry or wet sites (respectively). Previous control projects support this use.

Cultural controls include an education program to inform the public and adjacent landowners of the importance of controlling target species.

Mitigation Measures include the planting of natural vegetation to stabilize soils and replace lost root mass. Weed-free straw, or straw with a weed monitoring program, will also be used to prevent soil erosion or siltation in rivers. Reforestation using nursery stock selectively planted to appropriate zone (i.e.

riparian, floodplain, upland, etc.) and planting of native herbaceous ground cover will be considered. Project maintenance is the monitoring and treatment of re-growth.

Impacts of the preferred alternative:

Soil erosion / exotic invasion / wildlife habitat
Negligible to minor adverse impacts during initial control actions. Mitigating measures proposed will decrease negative impacts on the resource and cause greater positive long-term effects.

Public health and safety
A job site analysis will be completed to identify safety and health hazards, and will include to temporary closing of project areas. The proposed herbicide poses negligible effects on human health.

Natural resources
Short term, minor adverse effects to water resources due to the potential for erosion and increased siltation after the control phase. This will be mitigated by preventive measures. Long-term positive effects due to recovery of native vegetation populations that will improve watershed function. Healthy native communities will help mitigate future disturbances by providing larger wildlife habitat areas, and will strengthen the cultural and historical integrity of the park.

Cultural resources

Mechanical disturbances to cultural sites would be avoided through consultation with the park's Professional Services Division, and other control methods used if cultural artifacts were found. The park archeologist will be consulted where the use of chemical methods could affect soil chemistry on archeological sites. Unknown resources that may be exposed will have their significance determined and appropriate actions taken to protect them. The proposed action would restore the visual scene in accordance with approved cultural landscape reports. Several clearances from the Texas Historical Commission were received. On December 20, 2000, the commission received a copy of the "Assessment of Actions Having an Effect on Cultural Resources", which was returned with a determination of "No Adverse Effect – Project may Proceed", and a second letter was received on January 17, 2002 that stated "by applying the Section 106 criteria, we have determined that the proposed project meets the guidelines of no adverse effect…"

Threatened and Endangered Species

The Mountain Plover and Whooping Crane have the potential to be found in the park. Neither species have been sighted, and would not be found in areas needing treatment. If a T&E species is spotted in a treatment area, work would cease and qualified staff would evaluate the significance of the sighting to the surrounding habitat. Mitigation measures would be taken to reduce impact. On

September 20th 2001 a request for section 7 consultations for this project was sent to the Austin, Texas office of the US Fish & Wildlife Service [Dawn Whitehead]. Two replies were received. On November 6th 2001 she sent a reply stating, "we do not anticipate that the proposed actions would adversely impact any federally listed threatened or endangered species [consultation # 2-15-02-I-079]. This was confirmed in the second letter, dated December 6th, 2003, indicating that no threatened or endangered species are likely to be present and thus are not expected to be harmed by a project [consultation #2-15-2003-I-0089].

Public involvement is part of the NEPA process. The initial scoping meeting included: significant participation from land management agencies [San Antonio Missions staff, the Fire Management Officer from Big Thicket National Preserve, fire management staff from Lyndon B. Johnson National Historical Park, a representative from the Texas Forest Service, and a staff member of the Nature Conservancy of Texas], a congressional aide, representatives from the City of San Antonio, a priest for the Archdiocese, and a biologist from Trinity University. The fire management plan will also be sent out for public review and comment prior to being approved.

Mechanical treatments not covered by the environmental assessment will be covered by a categorical exclusion on a case-by-case basis.

The consensus of the Fire Management Officer and Fire Ecologist of Big Thicket National Preserve, and San Antonio Mission's management staff is that continuation of the existing fire suppression policy, and utilization of limited mechanical & chemical treatments covered by an existing environmental assessment and Finding Of NO Significant Impact, does not result in any major adverse effects or impacts to NPS resources and values. Negative environmental impacts that could occur are minor and temporary in effect on the human environment. There are no unmitigated adverse impacts on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or known risks, cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law.

NPS Management Policies, 2001, require an analysis of potential effects to determine whether or not actions would impair park resources. Based on the above information, the IDT has determined that the potential impacts of the proposed fire management plan would not constitute "impairment" because it would not result in major or severe adverse effects upon resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; (2) key to the natural or cultural integrity of the park; or (3) identified as a goal in the park's general management plan or other relevant NPS planning documents.

As a result, this Memorandum to the files has been prepared and the NEPA process has been satisfied.

/s/ *Stephen E. Whitesell* Authenticated by
Susan M. Hunt
Stephen E. Whitesell Management Assistant

cc:
Chris Turk, Regional Environmental Quality Coordinator, Denver
Eva Long, Natural Resource Management Specialist, Denver
Brian Swift, Regional Fire Management Officer, Denver
Bob Lineback, Wildland Fire Specialist, Santa Fe
David McHugh, Supervisory Fire Management Officer, BITH
Darrell Echols, Biologist, PAIS
Randy Larson, Chief Ranger, PAIS

D. Species lists.

1) Missions FMU

a) Flora

Annotated List of the Vascular Plants
of San Antonio Missions National Historic Park,
Bexar County, Texas
October 2002 Draft

William R. Carr
The Nature Conservancy of Texas

This draft includes all plant taxa observed on properties of the San Antonio Missions National Historic Park by Dr. W. O. Van Auken in 1981 (preceded by asterisks) and/or by the author during June-October 2001 and March-October 2002. Scientific names of naturally-occurring plants follow Jones, Wipff & Montgomery (1997); pertinent synonyms, particularly those used in Correll & Johnston (1970) and/or Van Auken (1981), are provided in brackets. Scientific names of cultivated plants follow Bailey Hortorium (1976). Common names follow Diggs, Lipscomb & O'Kennon (1999), Hatch, Gandhi & Brown (1990) and various other sources

FERNS AND FERN ALLIES

Equisetaceae Horsetail Family

**Equisetum laevigatum* A. Braun. Horsetail. Native perennial. Rare in area but locally common on bank of old river channel upstream from old Espada Dam in Espada Park. Voucher: Carr 19881. Photo: SAM-205. Line drawing: Diggs et al. (1999), p. 177.

Pteridaceae Maidenhair Fern Family

**Adiantum capillus-veneris* L. Maidenhair-fern. Native perennial. Rare in area but conspicuous in a few wet spots, such as the face of Espada Dam and leak zones on Espada Aqueduct; also in alluvial soil on bank of Sixmile (Piedras) Creek just downstream from aqueduct. Voucher: Carr 20810. Photo: SAM-837. Line drawing: Diggs et al. (1999), p. 197.

Astrolepis sinuata (Lag. ex Swartz) Benham & Windham [*Notholaena sinuata* (Lag. & Segura ex Swartz) Kaulf.] Wavyleaf cloakfern. Native perennial. Rare, one plant about 7 ft. up on N-facing rock wall on inside of SW corner of Mission San Juan compound, at N29°19.916', W098°27.319' +/- 42.8 ft. Observed in desiccated condition on 3 August 2001, removed by maintenance crew later that month; not seen in 2002. Photo: SAM-408.

Cheilanthes alabamensis (Buckl.) Kunze. Alabama lipfern. Native perennial. Rare in area, noted only on cemented alluvium exposed on walls of shallow box canyon (or old quarry?) on N side of I-410 just W of San Antonio River floodplain, at N29°19.397', W098°27.211' +/- 25.0 ft. Voucher: Carr 21362. Photo: SAM-556. Line drawing: Diggs et al. (1999), p. 197.

Cheilanthes horridula Maxon. Hairy lipfern. Native perennial. Rare, noted only on rock and mortar of walls of Mission Concepción. Voucher: Carr & Benesh 19811. Photo: SAM-429. Line drawing: Diggs et al. (1999), p. 197.

Cheilanthes lindheimeri Hook. Lindheimer lipfern. Native perennial. Rare, noted only on rock wall at SE corner of Mission Concepción, where plants were in desiccated condition during 2001; presumably removed during restoration in 2002. Voucher: Carr & Benesh 19810. Photo: SAM-230.

Thelypteridaceae Shield-fern Family

**Thelypteris ovata* St. John var. *lindheimeri* (Christensen) A. R. Smith [*Thelypteris kunthii* of Texas authors, in part]. Lindheimer shield-fern, river fern. Native perennial. Occasional on banks of Acequia de Espada at Espada Aqueduct and N of Ashley Rd. Voucher: Carr 20926. Photo: SAM-897. Line drawing: Diggs et al. (1999), p. 205.

CONIFERS

Cupressaceae Cypress Family

Juniperus ashei Buchh. Ashe juniper. Native tree or large shrub. One planted shrub at Mission San Juan appears to be this species; absent from natural landscapes. Photo: SAM-255. Line drawing: Diggs et al. (1999), p. 205.

**Juniperus virginiana* L. Eastern red cedar. Native tree. One planted tree at Mission Concepción appears to be this species; absent from natural landscapes. Photo: SAM-226. Line drawing: Diggs et al. (1999), p. 205.

Taxodiaceae Baldcypress Family

**Taxodium distichum* (L.) Rich. Baldcypress. Native tree. Rare in area. One large tree along old river channel at Espada Park near old Espada Dam; at least three small trees along old river channel just NE of Mission Espada, at N29°19.157', W098°27.020'; recently planted at Mission San José. Voucher: Carr & Benesh 20913. Photos: SAM-208. Line drawing: Diggs et al. (1999), p. 209.

FLOWERING PLANTS

Acanthaceae Acanthus Family

Carlowrightia texana J. Henrickson & T. Daniel. Texas carlowrightia. Native perennial. Occasional in old fields, athletic fields and other open areas. Vouchers: Carr 19769, Carr 19847, Carr 21125. Photo: SAM-117. Line drawing: Diggs et al. (1999), p. 215.

Dicliptera brachiata (Pursh) Spreng. Dicliptera. Native perennial. Occasional in riparian woodlands. Vouchers: Carr & Gallyoun 20351, Carr 21361. Photo: SAM-564. Line drawing: Diggs et al. (1999), p. 215.

Justicia brandegeana Wassh. & Smith [*Beloperone guttata* Brandegee]. Shrimp plant. Introduced perennial. Planted in landscapes at Mission Concepción, Mission Espada, Mission San Juan. Photo: SAM-961.

**Justicia pilosella* (Nees) Hilsenbeck [*Siphonoglossa pilosella* Nees]. Hairy tubetongue. Native perennial. Common in lawns, athletic fields and other open areas. Voucher: Carr 19864. Photo: SAM-148. Line drawing: Diggs et al. (1999), p. 217.

Justicia spicigera Schlect. Orange justicia, mohintli. Introduced shrub (or hardy perennial). One large shrub or hardy perennial in front of restrooms on north side of church, Mission San José, at N29°21.754', W098°28.783' +/- 22.2 ft. Photos: SAM-349.

Ruellia brittoniana E. Leonard. Britton ruellia, Britton wild-petunia. Introduced perennial. In garden in front of visitor center at Mission San José. In addition to the typical tall form, the dwarf "Katie's" cultivar is also present. Photo: SAM-187. Line drawing: Diggs et al. (1999), p. 215.

Ruellia drummondiana (Nees) Gray. Drummond wild-petunia. Native perennial. Rare in riparian woodlands. Voucher: Carr 21224. Photo: SAM-1083. Line drawing: Diggs et al. (1999), p. 217.

Ruellia metzae Tharp. Sister Mary Claire Metz's wild-petunia, white ruellia. Native perennial. Apparently rare in area, noted only in old field on San Juan Dam tract. Voucher: Carr 21159. Photo: SAM-965. Line drawing: Diggs et al. (1999), p. 217.

Ruellia nudiflora (Gray) Urban var. *runyonii* (Tharp & Barkley) B. L. Turner [*Ruellia runyonii* Tharp & Barkley]. Runyon ruellia. Native perennial. Common in upland woodlands and old fields. Vouchers: Carr 19807, Carr 19836, Carr 19856. Photo: SAM-046, SAM-065, SAM-066, SAM-094, SAM-095, SAM-096, SAM-097, SAM-193, SAM-194.

**Ruellia yucatana* (Leonard) Tharp & Barkley [*Ruellia nudiflora* (Engelm. & Gray) Urban var. *yucatana* Leonard. Yucatan wild-petunia. Native perennial. Reported by Van Auken (1981) from all mission tracts. According to Turner (1991), *Ruellia yucatana* is restricted to southern tip of Texas, south of a line between Laredo and Corpus Christi.

Aceraceae Maple Family

**Acer negundo* L. var. *texanum* F. Pax. Box-elder maple. Native tree. Common in riparian woodlands. Voucher: Carr 19874. Photo: SAM-505. Line drawing: Diggs et al. (1999), p. 223.

Agavaceae Agave Family

Agave sp. (*Agave americana* L.?). Introduced shrub. One shrub (near old home site?) in mesquite woodland on N side of I-410 just W of San Antonio River, at N29°19.393', W098°27.218'+/- 23.6 ft. Photo: SAM-679.

Agave sp. (*Agave lophantha* Schiede?). Introduced shrub. Planted in landscapes at Mission Concepción, Mission San Juan and Mission San José. Photos: SAM-020, SAM-342, SAM-343.

Agave sp. (*Agave scabra* Salm-Dyck?). Introduced shrub. Planted in garden at Mission San José. Photo: SAM-1052.

Agave sp. Agave. Introduced shrub. Small (at present?) species; leaves grayish, concave in cross-section (not flat), with scattered dark slender recurved spines along margins. Planted in front of church at Mission San Juan. GPS point: N29°19.948', W098°27.321' +/- 35.7 ft. Photo: SAM-253, SAM-254.

Agave sp. Agave. Introduced shrub. Larger than preceding species; leaves greener, flat and erect in lower portion, slightly convex and curved outward at apex, with smooth margins (at least on upper half). Planted in front of church at Mission San Juan. GPS point: N29°19.948', W098°27.324' +/- 26.1 ft. Photo: SAM-251.

**Dasylirion texanum* Scheele. Sotol. Shrub, native to western Bexar County and westward, introduced here. Planted in garden and landscape at Mission San José. Photo: SAM-975, SAM-976.

**Hesperaloe parviflora* (Torr.) Coult. Red-flower yucca. Introduced shrub. Planted in landscapes at Mission Concepción, Mission Espada and Mission San José. Photo: SAM-275, SAM-276. Line drawing: Diggs et al. (1999), p. 1081.

Yucca baccata Torr. Datil yucca. Introduced shrub. According to the flora-and-fauna binder at the visitor center, this species is planted in front of convento at Mission San José. Not observed during this survey

Yucca constricta Buckl. Buckley yucca. Native shrub. An essentially acaulescent yucca with a rosette of numerous leaves to ca. 4 dm long and to ca. 2 cm wide (usually ca. 1-1.5 cm wide), with white corneous margins sporting curling white fibers; scapes usually a least 2 m tall; inflorescence a panicle (rather than a raceme). Occasional in upland woodlands and old fields. None of these plants bore fruit during 2001. Voucher: Carr 20928. Photos: SAM-040, SAM-041, SAM-365, SAM-366.

Yucca pallida McKelvey. Pallid yucca, blue yucca. Introduced shrub. Planted in newer garden at Mission San José; absent from the natural landscape. Photo: SAM-247, SAM-248. Line drawing: Diggs et al. (1999), p. 1085.

**Yucca treculeana* Carr. Spanish dagger. Native shrub. Occasional in upland woodlands. Some of the "Spanish daggers" planted in landscapes around various missions could also be this species, or they may be *Yucca torreyi* Shafer, a similar plant native to western Texas. Photo: SAM-322, SAM-323. Line drawing: Diggs et al. (1999), p. 1089.

**Yucca tenuistyla* Trel. White-rim yucca. Native shrub. Reported by Van Auken (1981) from Mission San José and Mission Espada.

Yucca sp. Flaccid-leaf yucca. Introduced shrub. Acaulescent; leaves flaccid, to ca. 6 cm wide and .75 m long. Planted in landscape at Mission San José and Mission Concepción.. According to flora and fauna binder at visitor center, these plants are *Yucca recurvifolia* Salisb. They might also be *Yucca gloriosa* L. Photo: SAM-006, SAM-1097.

Yucca sp. Yucca, Spanish dagger. Shrub. A trunked yucca, usually branched above, to 3-4 meters tall. Planted on grounds on S side of Mission San José compound, NW of visitor center. GPS point: N29°21.637', W098°28.826' +/- 21.3 ft. Photo: SAM-282.

Alismaceae Arrowleaf Family

**Sagittaria graminea* Michx. Grassy arrowhead. Native perennial. Reported by Van Auken (1981) from Mission Espada and Espada / Acequia Park.

Sagittaria platyphylla (Engelm.) J. G. Smith. Delta arrowleaf. Native perennial. Occasional in Acequia de Espada just N and S of Ashley Rd. and at Mission Espada. Vouchers: Carr 19833; Carr 21156. Photo: SAM-964. Line drawing: Diggs et al. (1999), p. 1091.

Aloeaceae Aloe Family

Aloe sp. Aloe. Introduced perennial. Planted in front of chapel at Mission San Juan. Photo: SAM-903, SAM-904, SAM-940.

Amaranthaceae Amaranth Family

**Alternanthera caracasana* H. B. K. Verdolago de puerco, mat chaff-flower. Native perennial. Common weed in unshaded lawns. Voucher: Carr 19772. Photo: SAM-256, SAM-257, SAM-876. Line drawing: Diggs et al. (1999), p. 223.

**Alternanthera philoxeroides* (Mart.) Grisebach. Alligator-weed. Naturalized perennial. Occasional along Acequia de Espada at Espada Park and near Espada Aqueduct; also in San Antonio River in general vicinity. Voucher: Carr & Benesh 21051. Photo: SAM-905. Line drawing: Diggs et al. (1999), p. 223.

**Amaranthus crassipes* Schlecht. Pigweed. Native annual. Reported by Van Auken (1981) from all mission sites.

**Amaranthus palmeri* S. Wats. Careless-weed, redroot. Native annual. Frequent to common in old fields and other open disturbed sites. Vouchers: Carr 19780, Carr 19803. Photo: SAM-034, SAM-035. Line drawing: Diggs et al. (1999), p. 229.

Amaranthus polygonoides L. [*Amaranthus berlandieri* (Moq.) Uline & Bray; *Amaranthus polygonoides* L. var. *berlandieri* (Moq.) Thell.] Berlandier amaranth, tropical amaranth. Native annual. Frequent in dry open disturbed sites, particularly at Mission San José. Vouchers: Carr 19890; Carr 19779. Photo: SAM-941, SAM-992. Line drawing: Diggs et al. (1999), p. 229.

Celosia nitida Vahl. Albahaca. Native perennial. Rare in riparian woodlands, noted in only a few spots along Espada Aqueduct. Voucher: Carr & Benesh 21054. Photo: SAM-898.

Anacardiaceae Pistachio Family

Rhus lanceolata (Gray) Britt. [*Rhus copallina* L. var. *lanceolata* Gray]. Flameleaf sumac. Introduced tree. One planted tree at head of San Juan Woodland Trail near SW corner of Mission San Juan complex. Photo: SAM-176. Line drawing: Diggs et al. (1999), p. 235.

**Toxicodendron radicans* (L.) Kuntze [*Toxicodendron rydbergii* (Small ex Rydb.) Greene; *Rhus radicans* var. *vulgaris* (Michx.) A. DC.]. Poison ivy. Native woody vine. Common in riparian and upland woodlands. Voucher: Carr 20776. Photo: SAM-126, SAM-127, SAM-826.

Apiaceae (Umbelliferae) Carrot Family

**Ammi majus* L. Bishop's-weed. Introduced perennial. Rare along margins of riparian woodlands; more common, at least during April 2002, on graded banks of new channel of San Antonio River. Reported by Van Auken (1981) from Espada / Acequia Park. Vouchers: Carr 20813; Carr 20822. Line drawing: Diggs et al. (1999), p. 237.

Bowlesia incana Ruiz & Pav. Hoary bowlesia. Native annual. Occasional to frequent in shaded sites in riparian woodlands, but also in drier, sunnier sites on mission lawns. Vouchers: Carr 20451; Carr 20475. Photo: SAM-587, SAM-682, SAM-694, SAM-695. Line drawing: Diggs et al. (1999), p. 245.

Chaerophyllum tainturieri Hook. var. *dasycarpum* Hook. ex Wats. Hairyfruit chervil. Native annual. Common during spring in riparian woodlands, old fields and sitrubed sites. Voucher: Carr 20462. Photo: SAM-575, SAM-576. Line drawing: Diggs et al. (1999), p. 247.

Chaerophyllum tainturieri Hook. var. *tainturieri*. Chervil. Native annual. Common during spring in riparian woodlands. Voucher: Carr 20550. Photo: see SAM-575, SAM-576. Line drawing: Diggs et al. (1999), p. 247.

Cicuta maculata L. var. *maculata* [incl. *Cicuta mexicana* Coult. & Rose]. Water hemlock. Native perennial. Rare along partially shaded bank of old river channel above old Espada Dam in Espada Park. Voucher: Carr 19792. Photo: SAM-913. Line drawing: Diggs et al. (1999), p. 247.

**Coriandrum sativum* L. Cilantro, coriander. Introduced annual. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 251.

**Daucus pusillus* Michx. Little carrot, rattlesnake weed. Native annual. Occasional in old fields and upland woodlands; reported by Van Auken (1981) from Mission Espada. Photo: SAM-772, SAM-773. Line drawing: Diggs et al. (1999), p. 251.

**Hydrocotyle umbellata*. Water-penny. Native perennial. Reported by Van Auken (1981) from Espada / Acequia Park, perhaps erroneously. All *Hydrocotyle* observed during this survey belong to the next species. Line drawing: Diggs et al. (1999), p. 257.

Hydrocotyle verticillata Thunb. var. *triradiata* (Rich.) Fern. Whorled water-penny. Native perennial. Occasional on banks of waterways, e.g., along creek at old Espada Dam and along Sixmile (Piedras) Creek below Espada Aqueduct. Vouchers: Carr 20768; Carr & Benesh 21052. Photo: SAM-838, SAM-893. Line drawing: Diggs et al. (1999), p. 257.

Sanicula canadensis L. Canada snakeroot. Native perennial. Rare in riparian woodlands along San Juan Woodland Trail and Acequia de Espada. Voucher: Carr 20927. Line drawing: Diggs et al. (1999), p. 261.

Scandix pecten-veneris L. Venus'-comb, shepherd's-needle. Naturalized annual. Occasional to frequent during spring in riparian woodlands. Vouchers: Carr 20446; Carr 20458. Photo: SAM-578, SAM-579, SAM-598. Line drawing: Diggs et al. (1999), p. 261.

Spermolepis inermis (Nutt. ex DC.) Math. & Const. Smooth scaleseed. Native annual. Detected only in bluestem grassland at 9243 Villamain, but doubtless present elsewhere. Voucher: Carr 20757. Line drawing: Diggs et al. (1999), p. 261.

**Torilis arvensis* (Huds.) Link. Tall sockbane, hedge-parsley. Naturalized annual. Abundant in upland woodlands; common in old fields and on mission lawn; frequent to common in more open parts of riparian woodlands. Voucher: Carr 20821. Photo: SAM-800, SAM-801. Line drawing: Diggs et al. (1999), p. 263.

Torilis nodosa (L.) Gaertn. Low sockbane, knotted hedge-parsley. Naturalized annual. Occasional in old fields; also a weed in lawn near parking lot at Mission Concepción. Vouchers: Carr 20536; Carr 20757. Photo: SAM-713, SAM-714. Line drawing: Diggs et al. (1999), p. 263.

Apocynaceae Dogbane Family

Catharanthus roseus (L.) G. Don. Rose periwinkle. Introduced annual or perennial. Planted in garden in front of church at Mission Espada. Photo: SAM-301, SAM-302. Line drawing: Diggs et al. (1999), p. 267.

**Nerium oleander* L. Oleander. Introduced shrub. Planted in landscapes at several missions. Photo: SAM-227, SAM-830.

Trachelospermum asiaticum (Siebold & Zucc.) Nakai. Asian jasmine. Introduced creeping shrub. Planted in new gardens at Mission San José. Photo: SAM-273, SAM-274. Line drawing: Diggs et al. (1999), p. 267.

Vinca major L. Big-leaf periwinkle. Introduced woody vine. Rare in project area, a few feral plants in riparian woodland on slope just N of Mission Espada. Observed on 15 March 2002; absent from site on 19 June 2002, perhaps due to removal. Line drawing: Diggs et al. (1999), p. 271.

Aquifoliaceae Holly Family

Ilex decidua Walt. Possum haw, deciduous holly, winterberry. Native shrub. Rare in riparian woodlands; planted at Mission Concepción. Voucher: Carr & Benesh 21055. Photo: SAM-899. Line drawing: Diggs et al. (1999), p. 271.

Ilex vomitoria Ait. Yaupon. Native shrub. Planted in new gardens between parking lot and visitor center at Mission San José (some of these plants are dwarf cultivars); also planted at Mission Concepción. Photo: SAM-277, SAM-278, SAM-279. Line drawing: Diggs et al. (1999), p. 271.

Araceae Arum Family

**Colocasia esculenta* L. Elephant-ears. Naturalized perennial. Locally abundant on banks of old river channel above Espada Dam, just upstream from San Juan Woodland Trail (where possibly increasing in abundance), and at various locations along Acequia de Espada. Voucher: Carr & Gallyoun 20355. Photo: SAM-190, SAM-210. Line drawing: Diggs et al. (1999), p. 1097.

Araliaceae Aralia Family

Hedera canariensis Willd. Algerian ivy. Introduced woody vine. Climbing on stone wall of shrine (and into nearby pecan) NW of Mission Concepción. Identification courtesy of flora and fauna booklet at visitor center; very similar to English ivy (*Hedera helix* L.). Photo: SAM-238, SAM-239.

Arecaceae (Palmae) Palm Family

**Sabal minor* (Jacq.) Pers. Dwarf palmetto. Native shrub. Reported by Van Auken (1981) from Mission San Juan and Espada / Acequia Park. All *Sabal* observed in the Missions area duing this survey, both as specimen trees in landscapes and as escapes in riparian woodlands, are a trunked species presumed to be *Sabal mexicana*. Line drawing: Diggs et al. (1999), p. 1097.

**Sabal mexicana* Mart. Sabal palm. Naturalized tree. Planted in landscapes around various missions; escaped into riparian woodlands along old river channel just NW of Mission San Juan and along old river channel just NE of Mission Espada. Photo: SAM-229, SAM-264, SAM-265; juvenile plants (those likely to be mistaken for *Sabal minor*), photo SAM-505.

Aristolochiaceae Birthwort Family

Aristolochia erecta L. [*Aristolochia longiflora* Engelm. & Gray]. Swanflower, grassleaf pipevine. Native perennial. Rare in mission lawns, athlectic fields, and old fields with relatively short or sparse cover. Photo: SAM-123, SAM-124, SAM-757, SAM-758.

Asclepiadaceae Milkweed Family

Asclepias curassavica L. Butterflyweed, butterfly milkweed. Introduced perennial. Planted in garden at Mission Concepción. Photo: SAM-924.

Asclepias oenotheroides (Cham.) Schlecht. Hierba de zizotes. Native perennial. Occasional in old fields. Voucher: Carr & Price 20988. Photo: SAM-388, SAM-389, SAM-390, SAM-808, SAM-967. Line drawing: Diggs et al. (1999), p. 279.

Cynanchum barbigerum (Scheele) Shinners. Bearded swallow-wort. Native herbaceous perennial vine. Rare in upland woodlands. Voucher: Carr 21200. Photo: SAM-794, SAM-1038. Line drawing: Diggs et al. (1999), p. 281.

Cynanchum racemosum (Jacq.) Jacq. var. *unifarium* (Scheele) Sundell [*Cynanchum unifarium* (Scheele) Woodson]. Tayalote. Native herbaceous perennial vine. Occasional in upland woodland along W side of San Antonio River both N and S of Ashley / Mission Rd.; weed in garden at Mission San José. Voucher: Carr 21223. Photo: SAM-1039, SAM-1082. Line drawing: Diggs et al. (1999), p. 281.

**Matelea reticulata* (Engelm. ex Gray) Woodson. Pearl milkvine. Native herbaceous perennial vine. Occasional in riparian and upland woodlands. Voucher: Carr & Carré 20779. Photo: SAM-752, SAM-753, SAM-1018. Line drawing: Diggs et al. (1999), p. 286.

Asteraceae (Compositae) Sunflower Family

**Acmella oppositifolia* (Lam.) Jansen [*Spilanthes americana* (Mutis) Hieron.]. American spotflower. Native perennial. Locally common along old river channel at Espada Park; rare along bank of Acequia de Espada N of Ashley Rd. Vouchers: Carr 20795; Carr & Benesh 21352. Photo: SAM-878, SAM-1156. Line drawing: Diggs et al. (1999), p. 311.

Amblyolepis setigera DC. Huisache daisy. Native annual. Rare along margins of upland woodlands. Voucher: Carr 20474. Photo: SAM-625, SAM-626, SAM-681. Line drawing: Diggs et al. (1999), p. 311.

Ambrosia confertiflora A. DC. Field ragweed. Native perennial. Common in upland woodlands and old fields; also a frequent weed in mission lawns. Voucher: Carr & Gallyoun 20358. Photo: SAM-980. Line drawing: Diggs et al. (1999), p. 311.

Ambrosia psilostachya DC. [*Ambrosia cumanensis* Kunth in H. B. K.] Western ragweed. Native perennial. Occasional in upland woodlands and old fields. Voucher: Carr 19882. Photo: SAM-201, SAM-202. Line drawing: Diggs et al. (1999), p. 311.

**Ambrosia trifida* L. Giant ragweed. Native annual. Common to locally abundant in riparian woodlands; occasional to common in upland woodlands. Voucher: Carr 21197. Photo: SAM-377. Line drawing: Diggs et al. (1999), p. 311.

Aphanostephus ramosissimus DC. Lazy daisy. Native annual. Occasional in lawns, athletic fields and old field sites. Vouchers: Carr 19764; Carr 20540; Carr 20555; Carr 20737. Photo: SAM-584, SAM-585, SAM-590, SAM-629. Line drawing: Diggs et al. (1999), p. 313.

Artemisia ludoviciana Nutt. Western mugwort. Native perennial. Rare, one plant observed under *Celtis reticulata* sapling growing from crack at base of small concrete foundation at baseball diamonds on S side of Theo Ave. W of Mission Concepcion, at N29°23.353', W098°29.695'. Voucher: Carr 21274. Photo: SAM-1117. Line drawing: Diggs et al. (1999), p. 317.

Aster ericoides L. [*Symphyotrichum ericoides* (L.) Nesom]. Heath aster. Native perennial. Occasional in old fields and along margins of upland woodlands. Voucher: Carr & Gallyoun 20347. Photo: SAM-521, SAM-522, SAM-525. Line drawing: Diggs et al. (1999), p. 317.

Aster subulatus Michx. var. *ligulatus* Shinners [*Symphyotrichum divaricatum* (Nutt.) Nesom]. Hierba del marrano. Native perennial. Rare on banks of acequias and in depressional areas in old fields. Voucher: Carr 21279. Photo: SAM-1123. Line drawing: Diggs et al. (1999), p. 323.

Aster lanceolatus Willd. [*Symphyotrichum lanceolatum* (Willd.) Nesom] Woodland aster. Native perennial. Occasional in and along margins of riparian woodlands and hackberry strips along edges of old fields. Vouchers: Carr & Benesh 21346; Carr & Benesh 21349; Carr 21364. Photo: SAM-561. Line drawing: Diggs et al. (1999), p. 317.

Astranthium integrifolium (Michx.) Nutt. Western daisy. Native annual. Rare in openings in upland woodlands. Voucher: Carr & Carré 20781-B. Photo: SAM-785. Line drawing: Diggs et al. (1999), p. 323.

**Baccharis neglecta* Britt. Poverty weed, Roosevelt weed, baccharis. Native shrub. Occasional in old fields and upland woodlands. Voucher: Carr 21229. Photo: SAM-414, SAM-1089. Line drawing: Diggs et al. (1999), p. 323.

Bidens laevis (L.) B.S.P. Smooth beggar's-ticks. Native annual. Local on banks of old river channel at and above Espada Dam. Voucher: Carr & Benesh 21348. Photo: SAM-497, SAM-1153. Line drawing: Diggs et al. (1999), p. 327.

**Calyptocarpus vialis* Less. Prostrate lawnflower, straggler daisy. Native perennial. Common lawn weed at all missions; also common in riparian woodlands and upland woodlands;

occasional in old fields. Voucher: Carr 20893. Photo: SAM-507, SAM-791. Line drawing: Diggs et al. (1999), p. 331.

Centaurea americana Nutt. American basketflower. Native annual. Rare, one plant with immature heads observed on lawn at Mission Espada, 25 April 2002; a chance introduction that was mown before setting seed. Line drawing: Diggs et al. (1999), p. 333.

Centaurea melitensis L. Yellow star-thistle. Naturalized annual. Occasional in old fields, roadbeds, and weedy open upland woodlands. Voucher: Carr 20762. Photo: SAM-812. Line drawing: Diggs et al. (1999), p. 333.

Chaptalia texana Greene [*Chaptalia nutans* (L.) Polák var. *texana* (Greene) Burkhart]. Nodding lettuce. Native perennial. Rare in area, encountered only in upland woodland on N side of I-410 just W of San Antonio River floodplain. Voucher: Carr & Carré 20783. Photo: SAM-691, SAM-1016 (vegetative). Line drawing: Diggs et al. (1999), p. 337.

Cirsium texanum Buckl. Texas thistle. Native annual. Occasional in old fields and upland woodlands. Voucher: Carr 21102. Photo: SAM-745. Line drawing: Diggs et al. (1999), p. 343.

Conyza canadensis (L.) Cronq. Horseweed. Native annual. Robust individuals rare along margins of woodlands; much smaller plants occasional as weeds of garden beds and rock walls of Mission Concepción. Voucher: Carr 21180. Photo: SAM-001, SAM-002. Line drawing: Diggs et al. (1999), p. 343.

Coreopsis tinctoria Nutt. [*Coreopsis cardaminifolia* (DC.) T. & G.] Plains coreopsis. Native annual. Occasional in dry beds of acequias and along margins of woodlands. Vouchers: Carr 20747; Carr 20907. Photo: SAM-845. Line drawing: Diggs et al. (1999), p. 343.

**Coreopsis wrightii* (Gray) Parker [*Coreopsis basalis* (Dietr.) Blake var. *wrightii* (Gray) Blake. Wright coreopsis. Native annual. Reported by Van Auken (1981) from Mission San José and Mission Espada. Line drawing: Diggs et al. (1999), p. 343.

**Dyssodia tenuiloba* (DC.) Robinson var. *tenuiloba* [*Thymophylla tenuiloba* (DC.) Small var. *tenuiloba*]. Bristleleaf dogweed. Native annual. Occasional in old fields; reported by Van Auken (1981) from Mission San José. Voucher: Carr 20761. Photos: SAM-815. Line drawing: Diggs et al. (1999), p. 425.

Echinacea sp. Purple coneflower. Introduced perennial cultivar. Planted in gardens at Mission Concepción and Mission San José. Flora and fauna book at visitor center identifies this as a cultivar of *Echinacea purpurea* (L.) Moench. Photos: SAM-354.

Eclipta prostrata (L.) L. [*Eclipta alba* (L.) Hassk.] Yerba del tago. Native annual. Occasional on banks of waterways. Voucher: Carr 21155. Photo: SAM-963. Line drawing: Diggs et al. (1999), p. 349.

**Engelmannia pinnatifida* Gray ex Nutt. [*Engelmannia persisteria* (Raf.) Goodman & C. A. Lawson]. Engelmann's daisy. Native perennial. Locally frequent in old field on San Juan Dam tract. Voucher: Carr 19846. Photo: SAM-087, SAM-089. Line drawing: Diggs et al. (1999), p. 351.

Erigeron philadelphicus L. Philadelphia fleabane. Native perennial. Locally common in riparian woodland along Sixmile (Piedras) Creek at N29°19.886', W098°27.575 +/- 16.8 ft.; scattered in similar woodlands along Acequia de Espada. Photo: SAM-605. Line drawing: Diggs et al. (1999), p. 355.

Evax verna Raf. Roundhead rabbit-tobacco. Native annual. Occasional around bare spots in lawn at Mission San José; occasional in roadbeds at undeveloped sites. Voucher: Carr 20729; Carr & Price 20986. Photo: SAM-814. Line drawing: Diggs et al. (1999), p. 357.

Fleischmannia incarnata (Walt.) King & Robinson [*Eupatorium incarnatum* Walt.]. Scandent thoroughwort. Native perennial herbaceous vine. Rare in area but locally frequent in brushy upland woodland ca. 100-500 N of I-410 ft. from points 0.2-0.4 mi W of its bridges over San Antonio River, in Labores de Espada. Voucher: Carr 21359. Photo: SAM-1130. Line drawing: Diggs et al. (1999), p. 355.

Florestina tripteris DC. [*Palafoxia tripteris* (DC.) Shinners] White palafoxia. Native annual. Rare in old field in Labores de Espada and on baseball diamonds W of Missions Concepcion. Voucher: Carr 20371. Photo: SAM-528, SAM-529, SAM-1111.

**Gaillardia pulchella* Foug. Firewheels, Indian blanket. Native annual. Common or at least conspicuous in upland woodlands and unmown old fields. Voucher: Carr 20746. Photo: SAM-731, SAM-782. Line drawing: Diggs et al. (1999), p. 361.

**Gamochaeta falcata* (Lam.) Cabrera [*Gnaphalium falcatum* Lam.] Falcate cudweed. Naturalized annual. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 361.

Gamochaeta pensylvanica (Willd.) Cabrera [*Gnaphalium pensylvanicum* Willd.] Pennsylvania cudweed. Native annual. Rare on mission lawns. Voucher: Carr 20771. Line drawing: Diggs et al. (1999), p. 361.

Grindelia squarrosa (Pursh) Dun. Gumweed. Native annual. Occasional in upland woodlands. Vouchers: Carr 19796; Carr 20925. Photo: SAM-856. Line drawing: Diggs et al. (1999), p. 363.

Gutierrezia texana (A. DC.) T. & G. [*Xanthocephalum texanum* (A. DC.) Shinners]. Broomweed. Native annual. Occasional in upland woodlands and old fields. Voucher: Carr 21282. Photo: SAM-1103. Line drawing: Diggs et al. (1999), p. 367.

Hedypnois cretica (L.) Dum. Cours. Cretan composite. Naturalized annual. Rare on mission lawns; more frequent in disturbed soils along margin of hike-and-bike trail along San Antonio River near Mission Concepcion. Voucher: Carr 20467. Photo: SAM-654. Line drawing: Diggs et al. (1999), p. 367.

**Helianthus annuus* L. Common sunflower. Native annual. Occasional in dry open disturbed sites. Voucher: Carr 20896. Photo: SAM-038. Line drawing: Diggs et al. (1999), p. 371.

Helianthus debilis Nutt. subsp. *cucumerifolius* (T. & G.) Heiser. Weak sunflower. Native annual. Occasional in upland woodlands toward S end of Labores de Espada. Voucher: Carr 19785. Photo: SAM-311. Line drawing: Diggs et al. (1999), p. 371.

Helianthus maximiliani Schrad. Maximilian sunflower. Native perennial. One small colony in Labores de San Juan, W side of Villamain Rd. ca. 0.3 mi S of road to parking lot for Mission San Juan, at N29°19.715, W098°27.023' +/- 17.4.; another on E side of South Presa St., ca. 100-300 ft. N of Graf Rd. Voucher: Carr 21280. Photo: SAM-523, SAM-524. Line drawing: Diggs et al. (1999), p. 371.

Heterotheca subaxillaris (Lam.) Britt. & Rusby [*Heterotheca latifolia* Buckl.]. Camphor goldenaster. Native annual. Rare in old fields and upland woodlands. Voucher: Carr 21281. Photo: SAM-490, SAM-491. Line drawing: Diggs et al. (1999), p. 373.

Hymenopappus scabiosaeus L'Her. var. *corymbosus* (T. & G.) B. L. Turner. Old plainsman. Native biennial. Locally common in decent grassland at 9243 Villamain; rare in old fields elsewhere in Labores de Espada; also rare in upland woodlands. Voucher: Carr 20754. Photo: SAM-810. Line drawing: Diggs et al. (1999), p. 377.

Iva annua L. Eggleaf sumpweed. Native annual. Locally frequent along old river channel at Espada Park. Voucher: Carr 21286. Photo: SAM-496, SAM-1127. Line drawing: Diggs et al. (1999), p. 379.

Lactuca floridana (L.) Gaertn. Florida wild-lettuce. Native annual. Locally common in woodland along Acequia de Espada N of Ashley Rd. Voucher: Carr 19876. Photo: SAM-1025. Line drawing: Diggs et al. (1999), p. 383.

Lactuca ludoviciana (Nutt.) Ridd. Louisiana wild-lettuce. Native biennial. Frequent in and along margins of riparian and upland woodlands. Voucher: Carr 19787. Photo: SAM-895, SAM-896. Line drawing: Diggs et al. (1999), p. 383.

Lactuca serriola L. Prickly lettuce. Naturalized annual or biennial. Occasional in old fields, along woodland margins and in disturbed areas. Voucher: Carr 19849. Photo: SAM-088. Line drawing: Diggs et al. (1999), p. 383.

Lindheimera texana Gray & Engelm. Texas star. Native annual. Occasional in upland woodlands and old fields. Voucher: Carr 20472. Photo: SAM-669. Line drawing: Diggs et al. (1999), p. 385.

Lygodesmia texana (T. & G.) Greene. Texas skeletonplant. Native perennial. Rare in old fields. Voucher: Carr 21176. Photo: SAM-731, SAM-996, SAM-1007. Line drawing: Diggs et al. (1999), p. 385.

Mikania scandens (L.) Willd. Climbing hempweed. Native perennial herbaceous vine. Local on unshaded banks of old river channel upstream from old Espada Dam; along Acequia de Espada upstream from (N of) Ashley Rd. culvert; and at Espada Aqueduct. Voucher: Carr 20099. Photo: SAM-416, SAM-1149. Line drawing: Diggs et al. (1999), p. 389.

**Parthenium confertum* Gray. Lyreleaf parthenium. Native perennial. Reported by Van Auken (1981) from all mission sites.

Parthenium hysterophorus L. False ragweed. Native annual. Common in lawns and other disturbed open upland sites. Vouchers: Carr 19872, Carr 21154. Photo: SAM-008, SAM-009, SAM-183, SAM-184. Line drawing: Diggs et al. (1999), p. 395.

Pluchea odorata (L.) Cass [*Pluchea purpurascens* (Sw.) DC.] Camphor marsh-elder, purple march-fleabane. Native perennial. Apparently rare in area, a few plants among wetland vegetation in impoundment upstream from Old Espada Dam. Voucher: Carr 21195. Photo: SAM-1030. Line drawing: Diggs et al. (1999), p. 397.

**Pyrrhopappus pauciflorus* (D. Don) DC. [*Pyrrhopappus multicaulis* DC.]. False dandelion. Native annual. Occasional in old fields and open parts of various woodlands. Voucher: Carr 20805. Photo: SAM-619, SAM-620. Line drawing: Diggs et al. (1999), p. 401.

**Ratibida columnifera* (Nutt.) Woot. & Standl. [*Ratibida columnaris* (Sims) D. Don]. Mexican hats. Native annual. Occasional in upland woodlands and old fields. Voucher: Carr 20891. Photo: SAM-090, SAM-091. Line drawing: Diggs et al. (1999), p. 401.

Rudbeckia hirta L. var. *angustifolia* (Moore) Perdue. Black-eyed Susan. Native annual. Apparently rare in area, noted only in partially shaded dry bed of Acequia de San Juan. Voucher: Carr 20899. Photo: SAM-788. Line drawing: Diggs et al. (1999), p. 401.

Simsia calva (Engelm. & Gray) Gray. Bush sunflower. Native perennial. Rare, noted only along margin of upland woodland just NE of Espada Rd. bridge over Sixmile (Piedras) Creek. Vouchers: Carr 19818, Carr 20806. Photo: SAM-445, SAM-446, SAM-761, SAM-762. Line drawing: Diggs et al. (1999), p. 407.

Solidago canadensis T. & G. [*Solidago altissima* L.] Common goldenrod. Native perennial. Locally common along Acequia de Espada just downstream from Espada Aqueduct and along impoundment upstream from Espada Dam in Espada Park. Vouchers: Carr & Gallyoun 20349; Carr 21283; Carr 21347. Photo: SAM-1124. Line drawing: Diggs et al. (1999), p. 407.

Solidago gigantea Ait. Giant goldenrod. Native perennial. Locally abundant in one old field in Labores de Espada. Voucher: Carr 20377. Photo: SAM-520. Line drawing: Diggs et al. (1999), p. 411.

**Sonchus asper* (L.) Hill. Sow-thistle. Naturalized annual. Occasional throughout. Voucher: Carr 19866. Photo: SAM-101, SAM-102, SAM-616. Line drawing: Diggs et al. (1999), p. 417.

Sonchus oleraceus L. Sow-thistle. Naturalized annual. Occasional throughout. Vouchers: Carr 21160. Photo: SAM-972. Line drawing: Diggs et al. (1999), p. 419.

**Taraxacum officinale* Weber. Dandelion. Naturalized perennial. Occasional weed of mission lawns and roadbeds. Voucher: Carr 21194. Photo: SAM-613, SAM-614. Line drawing: Diggs et al. (1999), p. 419.

Thelesperma filifolium (Hook.) Gray. Slender greenthread. Native perennial. Rare in old fields on San Juan Dam Tract and Labores de Espada. Vouchers: Carr 20732, Carr 21201. Photo: SAM-1040. Line drawing: Diggs et al. (1999), p. 423.

Verbesina virginica L. Frostweed. Native perennial. Occasional in riparian and upland woodlands. Voucher: Carr 21199. Photo: SAM-424, SAM-513, SAM-1036, SAM-1037, SAM-1044. Line drawing: Diggs et al. (1999), p. 429.

Viguiera dentata (Cav.) Spreng. Plateau goldeneye. Native perennial. Frequent along margins of upland and riparian woodlands, often spreading into adjacent old fields. Vouchers: Carr 19765, Carr & Benesh 19814; Carr 19834; Carr & Gallyoun 20357, Carr 20376. Photo: SAM-502. Line drawing: Diggs et al. (1999), p. 431.

**Xanthium strumarium* L. Abrojo, cocklebur, porcupine eggs. Native annual. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 431.

Unknown vegetative Asteraceae? One colony in old field in Espada de San Juan, W side of Villamain ca. 100 ft. S of jct. with road to parking lot for Mission San Juan, at N29°19.882, W098°27.182' +/- 13.7 ft. Voucher: Carr 19835.

Berberidaceae Barberry Family

**Berberis trifoliolata* Moric. [*Mahonia trifoliolata* (Moric.) Fedde] Agarito. Native shrub. Occasional in upland woodlands; occasionally utilized in landscapes around missions (e.g., at Mission San José). Voucher: Carr & Carré 20786. Photo: SAM-671. Line drawing: Diggs et al. (1999), p. 435.

**Nandina domestica* Thunb. Heavenly bamboo. Naturalized shrub. Planted in landscape at Mission San José; one escaped plant in riparian woodland behind Mission San Juan. Voucher: Carr 21183. Photo: SAM-883, SAM-1051. Line drawing: Diggs et al. (1999), p. 435.3

Bignoniaceae Catalpa Family

Bignonia capreolata L. Crossvine. Woody vine, native to parts of Texas but perhaps only escaped from cultivation in this area. Rare in San Juan Woodland (upland woodland just W of Mission San Juan), at N29°19.904', W098°27.363' +/- 15.1 ft.; planted a few hundred yards to N, on fence along S side of Ashley Road at W end of Berg's Mill Bridge. Voucher: Carr 21072. Photo: SAM-943. Line drawing: Diggs et al. (1999), p. 447.

**Campsis radicans* (L.) Seeman ex Bureau. Trumpet creeper. Native woody vine. Common in riparian woodlands; also planted in landscape around missions. Voucher: Carr 21097. Photos: SAM-200, SAM-359, SAM-360. Line drawing: Diggs et al. (1999), p. 447.

Chilopsis linearis (Cav.) Sweet. Desert willow. Introduced shrub (native to west Texas but planted here). Planted in newer garden plots at Mission San José; recently planted along E bank of San Antonio River on or near NW edge of San Juan Dam tract. Photo: SAM-267, SAM-268. Line drawing: Diggs et al. (1999), p. 447.

Boraginaceae Borage Family

**Ehretia anacua* (Terán & Berl.) I. M. Johnst. Anaqua. Native tree. Occasional in upland woodlands, rare in riparian woodlands; more common as shade tree in landscapes around missions. Voucher: Carr 20801. Photo: SAM-141, SAM-142, SAM-829.

**Lappula occidentalis* (S. Wats.) Greene var. *cupulata* (Gray) Higgins [*Lappula texana* (Scheele) Britt; *Lappula redowskii* (Hornem.) Greene var. *texana* (Scheele) Brand.] Texas cupseed. Native annual. Reported by Van Auken (1981) from Mission Concepción. Line drawing: Diggs et al. (1999), p. 451.

**Lithospermum arvense* L. [*Buglossoides arvense* (L.) I. M. Johnston]. Bugloss. Naturalized annual. Occasional in old fields and disturbed soils. Voucher: Carr 20466. Photo: SAM-666. Line drawing: Diggs et al. (1999), p. 447.

Onosmodium bejariense A. DC. var. *bejariense*. Bexar marbleseed. Native perennial. Local in riparian woodland along Acequia de Espada N of Ashley Rd., at GPS point N29°22.222', W098°27.582' +/- 21.8 ft. Voucher: Carr 19874. Line drawing: Diggs et al. (1999), p. 455.

Brassicaceae (Cruciferae) Mustard Family

Capsella bursa-pastoris (L.) Medik. Shepherd's purse. Naturalized winter annual. Common weed in lawns at all missions. Voucher: Carr 20541. Line drawing: Diggs et al. (1999), p. 463.

Draba platycarpa T. & G. Broadpod draba. Native annual. Rare in bare areas in old fields and roadbeds. Voucher: Carr 20455. Photo: SAM-595, SAM-596. Line drawing: Diggs et al. (1999), p. 469.

Lepidium austrinum Small. Southern pepperweed. Native annual. Occasional in lawns and upland old fields. Voucher: Carr & Benesh 20922. Photo: SAM-705, SAM-706, SAM-902. Line drawing: Diggs et al. (1999), p. 471.

**Lepidium densiflorum* Schrad. Prairie pepperweed. Native annual. Reported by Van Auken (1981) from all mission sites. Line drawing: Diggs et al. (1999), p. 471.

Rapistrum rugosum (L.) All. Yellow rocket. Naturalized annual. Locally common in upland woodlands and old fields. Voucher: Carr 20743. Photo: SAM-591, SAM-592, SAM-655. Line drawing: Diggs et al. (1999), p. 477.

**Rorippa nasturtium-aquaticum* (L.) Hayek [*Nasturtium officinale* R. Br.]. Water cress. Naturalized perennial. Reported by Van Auken (1981) from Mission Espada and Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 477.

**Sisymbrium irio* L. London rocket. Naturalized annual. Occasional to common weed in mission lawns and old fields, often in partial shade. Voucher: Carr 20456. Photo: SAM-568, SAM-569, SAM-570. Line drawing: Diggs et al. (1999), p. 481.

Bromeliaceae Bromeliad Family

**Tillandsia recurvata* L. Ballmoss. Native perennial epiphyte. Occasional in trees throughout. Voucher: Carr & Benesh 20917. Photo: SAM-326. Line drawing: Diggs et al. (1999), p. 1097.

Buxaceae Boxwood Family

Buxus sempervirens L. Common boxwood. Introduced shrub. Planted near shrine on NW side of Mission Concepción and in front of convento at Mission San José. Photo: SAM-241, SAM-242, SAM-243.

Cactaceae Cactus Family

Ferocactus setispinus (Engelm.) Benson [*Thelocactus setispinus* (Engelm.) E. F. Anderson]. Hedgehog cactus, fish-hook cactus. Native shrub. Rare in area, several clusters under mesquite in upland woodland on N side of I-410 just W of cleared San Antonio River floodplain, at N29°19.437', W098°27.276' +/- 15.8 ft. and elsewhere. Voucher: Carr 21186. Photos: SAM-055, SAM-056, SAM-993, SAM-1055. Line drawing: Diggs et al. (1999), p. 495.

**Opuntia engelmannii* Salm-Dyck var. *lindheimeri* (Engelm.) Parfitt & Pinkava [*Opuntia lindheimeri* Engelm.]. Lindheimer pricklypear. Native shrub. Occasional in old fields and upland woodlands. Photo: SAM-293, SAM-325. Line drawing: Diggs et al. (1999), p. 493.2

Opuntia imbricata (Haw.) DC. Cholla. Introduced shrub. Planted in landscape at Mission San José. Photo: SAM-974.

**Opuntia leptocaulis* DC. Tasajillo, Christmas cactus, pencil cactus. Native shrub. Occasional in upland woodlands at Labores de Espada; one plant (possibly introduced) at head of San José Woodland Trail. Photo: SAM-261. Line drawing: Diggs et al. (1999), p. 493.

Opuntia sp. Prickly-pear. Introduced shrub (cultivar?). A *Platyopuntia* species with conspicuous brown glochids. Planted in landscape at Mission San José, at N29°21.647' W098°28.768'+/- 14.4 ft. Photo: SAM-024.

Opuntia sp. Prickly-pear. Introduced cultivar shrub. Plants forming massive clumps several meters wide and sometimes 2 meters tall; pads large, with crenate margins. Planted at several locations on grounds of Mission Espada, most notably at foot of cross in middle of mission grounds. GPS point: N29°19.982, W098°27.291' +/- 10.5 ft. Photo: SAM-167, SAM-168, SAM-169.

Opuntia sp. Prickly-pear. Introduced shrub (culitvar?). A nearly spineless form. Planted in front of chapel at Mission San Juan. GPS point: N29°19.945', W098°27.325' +/- 25.8 ft. Photo: SAM-260.

Campanulaceae Bellflower Family

Triodanis perfoliata (L.) Nieuw. var. *biflora* (Ruiz & Pav.) T. R. Bradley [*Triodanis biflora* (Ruiz & Pav.) Greene]. Venus' looking-glass. Native annual. Occasional in old fields, perhaps also on mission lawns. Voucher: Carr 20730. Photo: SAM-726, SAM-804. Line drawing: Diggs et al. (1999), p. 505.

Triodanis perfoliata (L.) Nieuw. var. *perfoliata*. Venus' looking-glass. Native annual. Occasional in old fields and on mission lawns. Voucher: Carr 20773. Photo: see SAM-726, SAM-804. Line drawing: Diggs et al. (1999), p. 505.

Cannaceae Canna Family

**Canna indica* L. Canna-lily, Indian-shot. Introduced perennial. Reported by Van Auken (1981) from Mission Espada.

Capparidaceae Caper Family

Polanisia dodecandra (L.) DC. subsp. *trachysperma* (T. & G.) Iltis. Clammyweed. Native annual. Apparently rare in area; one plant observed at edge of pile of old shingles in Johnsongrass hay-meadow at 9243 Villamain, 1 August 2002. Voucher: Carr 21181. Photo: SAM-1008, SAM-1009. Line drawing: Diggs et al. (1999), p. 509.

Caprifoliaceae Honeysuckle Family

**Lonicera japonica* Thunb. Japanese honeysuckle. Naturalized woody vine. Common in riparian woodland along Acequia de Espada N of Ashley Rd; less common in woodland along Acequia de Espada at Espada Aqueduct and in riparian woodland along Acequia de San Juan on E side of South Presa St. just N of Graf Rd. Voucher: Carr 20778. Photo: SAM-825. Line drawing: Diggs et al. (1999), p. 509.

Lonicera sempervirens L. Coral honeysuckle. Introduced woody vine. Planted in landscape around information center at Mission Concepción. Photos: SAM-357, SAM-358. Line drawing: Diggs et al. (1999), p. 509.

**Sambucus canadensis* L. var. *canadensis*. Elderberry. Native shrub. Locally common in riparian woodlands, usually on banks of acequias or old river channels. Voucher: Carr

21068. Photo: SAM-130, SAM-131, SAM-132, SAM-133, SAM-879, SAM-914. Line drawing: Diggs et al. (1999), p. 515.

Caryophyllaceae Pink Family

Polycarpon tetraphyllum (L.) L. Fourleaf manyseed. Naturalized annual. Rare, noted only in sandy soil at base of wall of Mission San José. Voucher: Carr & Price 20985. Photo: SAM-776. Line drawing: Diggs et al. (1999), p. 523.

**Silene antirrhina* L. Sticky catchfly, sleepy catchfly. Native annual. Occasional in old fields; reported by Van Auken (1981) from all mission sites. Voucher: Carr 20731. Line drawing: Diggs et al. (1999), p. 527.

Stellaria media (L.) Vill. Common chickweed. Naturalized annual. Occasional weed in lawns; also in riparian woodlands. Voucher: Carr 20549. Photo: SAM-721. Line drawing: Diggs et al. (1999), p. 527.

Celastraceae Staff-tree Family

Schaefferia cuneifolia Gray. Desert yaupon, panalero. Native shrub. Rare in area but locally frequent in brushy upland woodland ca. 100-500 N of I-410 ft. from points 0.2-0.4 mi W of its bridges over San Antonio River, in Labores de Espada. Vouchers: Carr 19898; Carr & Gallyoun 20345, Carr 21360. Photo: SAM-514.

Ceratophyllaceae Hornwort Family

Ceratophyllum demersum L. Common hornwort. Native annual submersed aquatic. Locally common in Acequia de Espada from Ashley/Mission Rd. bridge downstream to beyond Espada Aqueduct. Vouchers: Carr 21102, Carr 21133. Photo: SAM-938. Line drawing: Diggs et al. (1999), p. 531.

Chenopodiaceae Goosefoot Family

**Chenopodium album* L. Lamb's-quarters. Naturalized annual. Reported by Van Auken (1981) from four mission sites. Line drawing: Diggs et al. (1999), p. 537.

Chenopodium berlandieri Moq. Berlandier goosefoot. Native annual. Occasional in upland woodlands and disturbed sites. Vouchers: Carr & Benesh 19815; Carr 20109; Carr 21202. Photo: SAM-1042. Line drawing: Diggs et al. (1999), p. 537.

Monolepis nuttallianus (Schult.) Greene. Nuttall's monolepis. Native annual. Rare in area, noted only around bare spot on lawn within compound at Mission Espada, at N29°19.065, W098°27.056 +/- 12.3 ft., on 25 April 2002. Voucher: Carr 20772. Line drawing: Diggs et al. (1999), p. 541.

Commelinaceae Dayflower Family

Commelina erecta L. var. *angustifolia* (Michx.) Fern. Common dayflower. Native perennial. Frequent to common in upland woodlands and old fields. Voucher: Carr 19861. Photo: SAM-072, SAM-073, SAM-074, SAM-373, SAM-380. Line drawing: Diggs et al. (1999), p. 1099.

Commelina erecta L. var. *erecta*. Common dayflower. Native perennial. Occasional in upland woodlands. Voucher: Carr 20894. Photo: see SAM-072, SAM-073, SAM-074, SAM-373, SAM-380. Line drawing: Diggs et al. (1999), p. 1099.

**Commelina erecta* L. var. *deamiana* Fern. Deam's dayflower. Native perennial. Reported by Van Auken (1981) from all mission sites.

Setcreasea purpurea Boom or *Setcreasea pallida* Rose "Purple Heart". Purple wandering Jew. Introduced perennial cultivar. Planted at landscapes at Mission San Juan and Mission Concepción. Photo: SAM-224, SAM-406.

**Tinantia anomala* (Torr.) C. B. Clarke [*Commelinantia anomala* (Torr.) Tharp]. Widow's tears, false dayflower. Native annual. Common to locally abundant during spring in riparian woodlands. Voucher: Carr 20464. Photo: SAM-574, SAM-603, SAM-719. Line drawing: Diggs et al. (1999), p. 1103.

**Tradescantia occidentalis* (Britt.) Smyth. Western spiderwort. Native perennial. Reported by Van Auken (1981) from four mission sites. Line drawing: Diggs et al. (1999), p. 1105.

Tradescantia sp. [not *T. occidentalis*]. Spiderwort. Native perennial. Frequent on mission lawns; occasional in old fields and both upland and riparian woodlands. Voucher: Carr 20537. Photo: SAM-633, SAM-634, SAM-710, SAM-711.

Unknown. Introduced perennial with gray-green foliage. Planted around rocks in shaded depression (old quarry pit) on W side of lawn in front of Mission Concepción, at N29°23.439', W098°29.534' +/- 16.3 ft.

Convolvulaceae Morning-glory Family

Convolvulus arvensis L. Field bindweed. Naturalized perennial. Scattered in old fields, lawns and athletic fields; large colony in mown lawn on S side of Mission San José at N29°21.545', W098°28.765'. Vouchers: Carr 19775; Carr 21162; Carr 21182. Photo: SAM-968, SAM-1046. Line drawing: Diggs et al. (1999), p. 553.

**Convolvulus equitans* Benth. Common bindweed. Native perennial herbaceous vine. Occasional in upland old fields and lawns. Vouchers: Carr 19827; Carr 19848. Photo: SAM-079, SAM-080, SAM-081. Line drawing: Diggs et al. (1999), p. 553.

**Dichondra carolinensis* Michx. Carolina ponyfoot. Native perennial. Occasional in mission lawns and along margins of riparian woodlands. Voucher: Carr 20815; Carr & Benesh 20920. Photo: SAM-653. Line drawing: Diggs et al. (1999), p. 553.

Ipomaea carnea Jacq. var. *fistulosa* (Choisy) Austin. Shrubby morning-glory. Introduced shrub. One large individual on south side of building in southwest corner of Mission Espada complex, at N29°19.076', W098°27.071' +/- 13.7 ft. Photo: SAM-144, SAM-145, SAM-146.

**Ipomaea cordatotriloba* Dennstaedt [*Ipomaea trichocarpa* Ell. var. *trichocarpa*; *Ipomaea trichocarpa* Ell. var. *australis* O'Donnell; *Ipomaea trichocarpa* Ell. var. *torreyana* (Gray) Shinners]. Common morning-glory. Native perennial herbaceous vine. Occasional in upland woodlands and on lawns and athletic fields. Voucher: Carr 20890. Photo: SAM-075, SAM-076, SAM-077, SAM-180, SAM-181, SAM-182, SAM-1001. Line drawing: Diggs et al. (1999), p. 557.

Ipomaea hederacea Jacq. Ivyleaf morning-glory. Native annual vine. Rare in area, one patch on fenceline on N side of paved road toward N end of San Juan Dam tract. Voucher: Carr 21275. Photo: SAM-1119. Line drawing: Diggs et al. (1999), p. 557.

**Merremia dissecta* (Jacq.) Hall. f. [*Ipomaea dissecta* (Jacq.) Pers.; *Ipomaea sinuata* Ort.] Alamo-vine, correhuela de las doce. Native perennial herbaceous vine. Frequent in old fields and upland woodlands; also utilized in landscapes around missions. Voucher: Carr 21067. Photos: SAM-334, SAM-335, SAM-336, SAM-337, SAM-1094. Line drawing: Diggs et al. (1999), p. 559.

Cornaceae Dogwood Family

**Cornus drummondii* C. A. Mey. Roughleaf dogwood. Native shrub. Common in riparian woodlands. Voucher: Carr 20794. Photo: SAM-129, SAM-139, SAM-140, SAM-816, SAM-842. Line drawing: Diggs et al. (1999), p. 563.

Cucurbitaceae Gourd Family

Cucumis melo L. Muskmelon. Naturalized annual. One colony in graded unshaded area along top of slope along W side of new channel of San Antonio River, E edge of hike-and-bike trail just N of first footbridge N of I-410, at GPS point N29°19.471', W098°27.289'; also in woodland to W (clearly NPS property) but not flowering in that setting. Voucher: Carr & Gallyoun 20344. Photo: SAM-518, SAM-519. Line drawing: Diggs et al. (1999), p. 567.

**Cucurbita foetidissima* Kunth. Stinking gourd. Native annual herbaceous vine. Rare to locally abundant in old fields near Mission Concepción and in disturbed areas at Mission San José. Voucher: Carr 20816. Photo: SAM-107, SAM-413, SAM-877. Line drawing: Diggs et al. (1999), p. 567.

Ibervillea lindheimeri (Gray) Greene. Balsam gourd, Lindheimer balsam-apple. Native perennial herbaceous vine. Occasional in upland woodlands. Voucher: Carr 20808. Photo: SAM-515, SAM-775, SAM-839, SAM-909. Line drawing: Diggs et al. (1999), p. 571.

**Melothria pendula* L. Melonette, meloncito. Native annual herbaceous vine. Occasional in riparian woodlands. Voucher: Carr 20102. Photo: SAM-417, SAM-418. Line drawing: Diggs et al. (1999), p. 571.

Cyperaceae Sedge Family

Carex bulbostylis Mack. Globose caric-sedge. Native perennial. Rare in riparian woodlands. Vouchers: Carr 20459; Carr 20766; Carr 20796; Carr 20818. Line drawing: Diggs et al. (1999), p. 1117.

Carex emoryi Dew. Emory sedge. Native perennial. Rare in area, local along E bank of Acequia de Espada ca. 0.4 mi (by trail) N of Ashley Rd., at N29°20.410', W098°27.668' +/- 23.0 ft. Voucher: Carr 20820. Photo: SAM-1157. Line drawing: Diggs et al. (1999), p. 1121.

Carex leavenworthii Dewey. Leavenworth sedge. Native perennial. A few plants in shade of tall trees on N and E sides of Mission Concepción; also locally common on partially shaded lawn on S side of Ashley Rd. just E of bridge over old channel of San Antonio River, on NW corner of grounds of Mission San Juan. Voucher: Carr 20540. Photo: SAM-707, SAM-708. Line drawing: Diggs et al. (1999), p. 1125.

**Carex muhlenbergii* Schkuhr. Muhlenberg sedge. Native perennial. Reported by Van Auken (1981) from all mission sites. Line drawing: Diggs et al. (1999), p. 1127.

Carex tetrastachya Scheele [*Carex brittoniana* Bailey]. Britton sedge. Native perennial. Locally abundant in sewage swale on San Juan Dam Tract; a small colony on moist clay bank of Acequia de Espada ca. 2000 ft. N of Ashley Rd. Voucher: Carr 20744. Photo: SAM-806. Line drawing: Diggs et al. (1999), p. 1129.

Cyperus erythrorhizos Muhl. Redroot umbrellasedge. Native annual. Rare in area, noted only on piles of clay dredged in 2002 from Acequia de Espada north of Mission / Ashley Rd. Voucher: Carr 21226. Photo: SAM-1086. Line drawing: Diggs et al. (1999), p. 1137.

**Cyperus ochraceus* Vahl. Umbrella-sedge. Native perennial. Occasional along waterways. Voucher: Carr 19789. Photo: SAM-218, SAM-219.

**Cyperus odoratus* L. Common umbrellasedge. Native annual. Rare on unshaded bank of Acequia de Espada at W edge of Mission Espada. Voucher: Carr 21277. Photo: SAM-1121. Line drawing: Diggs et al. (1999), p. 1139.

**Cyperus papyrus* L. Papyrus. Introduced perennial. Reported by Van Auken (1981) from Mission Concepción.

Cyperus rotundus L. Purple nutsedge. Naturalized perennial. Common weed in old fields, mission lawns and garden beds. Voucher: Carr 21161. Photo: SAM-404, SAM-405, SAM-966. Line drawing: Diggs et al. (1999), p. 1141.

**Eleocharis montevidensis* Kunth. Montevideo spikesedge. Native perennial. Occasional on bank of old river channel upstream from old Espada Dam; a few plants in wet spot at foot of W end of Espada Aqueduct. Voucher: Carr 20544. Photo: SAM-717, SAM-718. Line drawing: Diggs et al. (1999), p. 1149.

**Schoenoplectus tabermaemontani* (Gmel.) Palla [*Scirpus validus* Vahl; *Scirpus tabermaemontani* Gmel.]. Softstem bulrush. Native perennial. Local, one large colony in pond upstream from old Espada Dam in Espada Park, at N29°20.837', W098°28.070' +/- 21.6 ft. Also reported by Van Auken (1981) from Mission Espada. Voucher: Carr 19795. Photo: SAM-199, SAM-495. Line drawing: Diggs et al. (1999), p. 1159.

Ebenaceae Ebony Family

**Diospyros texana* Scheele. Texas persimmon. Native shrub. Occasional in upland woodlands. Voucher: Carr & Carré 20787. Photo: SAM-310, SAM-516, SAM-1059. Line drawing: Diggs et al. (1999), p. 583.

Elaeagnaceae Russian-Olive Family

Elaeagnus macrophylla Thunb. Silverberry. Introduced shrub. One shrub ca. 5 m tall in riparian woodland along San Juan Woodland Tril, at N29°19.918', W098°27.394' +/- 16.1 ft.; escape from cultivation? Voucher: Carr 19784. Photo: SAM-171, SAM-172.

Euphorbiaceae Spurge Family

**Acalypha lindheimeri* Muell. Arg. [*Acalypha phleoides* Cav.] Lindheimer copperleaf. Native perennial. Rare, noted only in baseball diamonds on S side of W. Theo Ave. W of Mission Concepción. Voucher: Carr 19870. Photo: SAM-113, SAM-114. Line drawing: Diggs et al. (1999), p. 587.

Acalypha ostryifolia Riddell. Hornbeam copperleaf. Native annual. Occasional along woodland margins and in disturbed sites. Vouchers: Carr 20381; Carr 21152. Photo: SAM-501. Line drawing: Diggs et al. (1999), p. 587.

Argythamnia humilis (Engelm & Gray) Muell. Arg. var. *humilis* [*Ditaxis humilis* (Engelm. & Gray) Pax var. *humilis*]. Low wild-mercury. Native perennial. Rare in old field at San Juan Dam tract. Voucher: Carr 19808. Photo: SAM-949. Line drawing: Diggs et al. (1999), p. 603.

**Croton monanthogynus* Michx. One-seed croton, prairie tea. Native annual. Occasional in old fields. Voucher: Carr 19858. Photo: SAM-1000. Line drawing: Diggs et al. (1999), p. 603.

**Euphorbia albomarginata* T. & G [*Chamaesyce albomarginata* (T. & G.) Small. White-margin matspurge. Native perennial. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 591.

**Euphorbia cyathophora* Murr. [*Poinsettia cyathophora* (Murr.) Kl. & Gke. Wild poinsettia. Native annual. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 607.

**Euphorbia dentata* Michx. [*Poinsettia dentata* (Michx.) Kl. & Gke.] Toothed spurge. Native annual. Occasional in old fields and dry disturbed sites. Voucher: Carr 19850. Photo: SAM-078, SAM-371, SAM-372, SAM-970. Line drawing: Diggs et al. (1999), p. 607.

Euphorbia hirta L. [*Chamaesyce hirta* (L.) Millsp.] Introduced annual. Apparently a greenhouse weed that persists in outdoor gardens after introduction with nursery stock. Voucher: Carr 19879. Line drawing: Diggs et al. (1999), p. 595.

Euphorbia nutans Lag. [*Chamaesyce nutans* (Lag.) Small] Eyebane, nodding spurge. Native annual. Occasional in old fields and in gravel in creekbeds. Voucher: Carr 19851. Photo: SAM-375, SAM-376, SAM-997, SAM-1148. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia prostrata Ait. [*Chamaesyce prostrata* (Ait.) Small] Prostrate matspurge. Native annual. Occasional in dry disturbed sites at Mission San José. Vouchers: Carr 19782, 19783, Carr 19889, Carr 21185. Photo: SAM-462. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia serpens H.B.K. [*Chamaesyce serpens* (H.B.K.) Small] Smooth matspurge. Native annual. Rare in old fields. Voucher: Carr 20759; Carr 21179. Photo: SAM-1006, SAM-1074. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia spathulata Lam. [*Tithymalus spathulatus* (Lam.) Weber] Warty spurge. Native annual. Rare in old fields and upland woodlands. Voucher: Carr 20804. Line drawing: Diggs et al. (1999), p. 609.

Euphorbia sp. Introduced annual. Rare, noted only under boxwood (*Buxus sempervirens*) shrubs planted in heavily irrigated garden boxes in front of convento at Mission San José, 11 June 2002. Voucher: Carr & Benesh 21061. Photo: SAM-875.

Phyllanthus polygonoides Spreng. Knotweed leaf-flower. Native perennial. Occasional in old fields and openings in upland woodlands. Voucher: Carr 20807. Photo: SAM-919, SAM-998. Line drawing: Diggs et al. (1999), p. 613.

**Sapium sebiferum* (L.) Roxb. Chinese tallow. Naturalized tree. Rather rare in area: a few trees along Sixmile (Piedras) Creek between Espada Rd. bridge and hike-and-bike trail downstream; a few trees (mostly small) along impoundment behind old Espada Dam at Espada Park; one sapling along Acequia de Espada N of Mission/Ashley Rd. Reported by Van Auken (1981) from Mission San José but apparently not extant at that site. Voucher: Carr & Benesh 20916. Photo: SAM-223, SAM-861. Line drawing: Diggs et al. (1999), p. 615.

Tragia brevispica Engelm. & Gray. Climbing noseburn. Native perennial. Occasional in old fields at Labores de San Juan. Vouchers: Carr 19823, Carr 20912. Photo: SAM-1100, SAM-1131. Line drawing: Diggs et al. (1999), p. 615.

Tragia ramosa Torr. Common noseburn. Native perennial. Occasional in old fields at Labores de San Juan. Voucher: Carr 19845. Line drawing: Diggs et al. (1999), p. 615.

Fabaceae (Leguminosae) Legume Family

**Acacia minuata* (M. E. Jones) Beauchamp [*Acacia smallii* Isely; *Acacia farnesiana* of Texas authors]. Huisache. Native tree or large shrub. Common in upland and riparian woodlands; also utilized in landscapes around missions and in city parks along San Antonio River. Voucher: Carr 19837. Photo: SAM-930. Line drawing: Diggs et al. (1999), p. 627.

**Albizia julibrissin* Dur. Silktree mimosa. Introduced tree or large shrub. One declining tree (stump sprouts 2 ft. tall in July 2002) on lawn N of visitor center at Mission San José. Photo: SAM-928. Line drawing: Diggs et al. (1999), p. 627.

Astragalus nuttallianus DC. var. *trichocarpus* T. & G. Annual milkvetch. Native annual. Rare in old fields along Villamain. Voucher: Carr 20473. Photo: SAM-670. Line drawing: Diggs et al. (1999), p. 633.

Astragalus nuttallianus DC. var. ?? Milkvetch. Native annual. Rare on lawn just outside low wall at E edge of Mission Espada. Voucher: Carr 20553. Photo: SAM-724, SAM-725.

Caesalpinia pulcherrima L. Pride-of Barbados, dwarf poinciana, showy caesalpinia. Introduced shrub. Planted in landscape at Mission San José. Photo: SAM-188, SAM-189.

**Cercis canadensis* L. var. *texensis* (S. Wats.) M. Hopk. Texas redbud. Native tree. Reported by Van Auken (1981) from three mission sites. Line drawing: Diggs et al. (1999), p. 641.

Cercis canadensis L. var. *mexicanus* (Rose) Hopkins. Mexican redbud. Introduced tree. Planted in landscape at Mission San José. Photo: SAM-245.

**Desmanthus illinoensis* (Michx.) MacM. Illinois bundleflower. Native perennial. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 653.

**Desmanthus virgatus* (L.) Willd. var. *depressus* (Humb. & Bonpl.) B. L. Turner. Sharp-pod bundleflower. Native perennial. Frequent in old fields and athletic fields; reported by Van Auken (1981) from all mission sites. Vouchers: Carr 19771, Carr 19786, Carr 19825. Photo: SAM-137, SAM-138, SAM-1162. Line drawing: Diggs et al. (1999), p. 653.

**Eysenhardtia texana* Scheele. Texas kidneywood. Native shrub. Rare in upland woodlands. Voucher: Carr 20929. Photo: SAM-411, SAM-412, SAM-447, SAM-488. Line drawing: Diggs et al. (1999), p. 659.

**Gleditsia triacanthos* L. Honey locust. Introduced tree. Reported by Van Auken (1981) from three mission sites. Line drawing: Diggs et al. (1999), p. 661.

**Leucaena leucocephala* (Lam.) de Wit. Popinac, lead-tree. Introduced tree. Reported by Van Auken (1981) from Mission San José. A cultivated species of *Leucaena* is still present on the grounds, but its identity is unknown. Photo: SAM-872.

**Medicago polymorpha* L. var. *vulgaris* (Benth.) Shinners. Burclover. Naturalized annual. Occasional weed in mission lawns and old fields. Voucher: Carr 20465. Line drawing: Diggs et al. (1999), p. 675.

**Melilotus albus* Medic. White sweet-clover. Naturalized annual. Rare in upland woodlands at Labores de Espada on W side of San Antonio River; more common on disturbed banks of channelized sections of San Antonio River (not NPS property). Voucher: Carr & Benesh 21056 (taken ca. 50 outside NPS property). Photo: SAM-900. Line drawing: Diggs et al. (1999), p. 675.

**Mimosa latidens* (Small) B. L. Turner [*Schrankia latidens* (Small) Schum.]. Sensitive briar. Native perennial. Occasional in upland old fields. Vouchers: Carr 19770, Carr 19844. Photo: SAM-082, SAM-083, SAM-841, SAM-886. Line drawing: Diggs et al. (1999), p. 681.

Neptunia lutea (Leavenw.) Benth. Yellowpuff. Native perennial. Occasional in mown lawns at Mission San José. Voucher: Carr 19776. Photos: SAM-186, SAM-330, SAM-331. Line drawing: Diggs et al. (1999), p. 681.

**Parkinsonia aculeata* L. Retama. Native tree or large shrub. Occasional in upland woodlands and old fields. Voucher: Carr 20892. Photo: SAM-844. Line drawing: Diggs et al. (1999), p. 685.

**Prosopis glandulosa* Torr. var. *glandulosa*. Honey mesquite. Native tree. Common but inconspicuous in old fields, becoming more apparent as these succeed to upland woodlands; old native trees retained in landscapes around missions. Voucher: Carr 19871. Photos: SAM-031, SAM-032, SAM-353. Line drawing: Diggs et al. (1999), p. 689.

**Rhynchosia minima* (L.) DC. Least snoutbean. Perennial herbaceous vine, perhaps introduced. Occasional to common in upland woodlands and old fields. Vouchers: Carr 20379, Carr 20911. Photo: SAM-1005. Line drawing: Diggs et al. (1999), p. 693.

Rhynchosia senna Hook. var. *texana* (T. & G.) M. C. Johnst. [*Rhynchosia texana* T. & G.] Texas snoutbean. Native perennial herbaceous vine. Rare in old field and upland woodlands. Voucher: Carr 21131. Photo: SAM-933. Line drawing: Diggs et al. (1999), p. 693.

Sesbania herbacea (Mill.) McVaugh [*Sesbania macrocarpa* Muhl.; *Sesbania exaltata* (Raf.) Hill]. Bequilla, coffee-bean sesbania. Native annual. Rare in dry bed of Acequia de San Juan

on San Juan Dam Tract. Voucher: Carr 20905. Photo: SAM-848. Line drawing: Diggs et al. (1999), p. 699.

Sophora affinis T. & G. Eve's necklace. Native tree or large shrub. Rare, one small tree noted along old road in Labores de Espada, at GPS point: N29°19.683', W098°27.489' +/- 15.7 ft. Voucher: Carr 19892. Photo: SAM-289, SAM-290. Line drawing: Diggs et al. (1999), p. 699.

**Sophora secundiflora* (Ort.) DC. Texas mountain-laurel. Native shrub. Planted in landscapes at Mission San José and Mission Concepción and in wildscape behind Mission San Juan, but apparently not a member of the local native flora. Photo: SAM-873, SAM-884. Line drawing: Diggs et al. (1999), p. 699.

+*Strophostyles helvula* (L.) Britt. Wildbean, sidebeak pencil-flower. Native perennial herbaceous vine. Local in opening in riparian woodland along Acequia de Espada ca. 1/4 mi N of Ashley / Mission Rd.; rare in this area in 2001, locally abundant on piles of clay dredged from acequia in 2002. Vouchers: Carr 20103; Carr 21225. Photo: SAM-1026 (vegetative); SAM-1085 (flower and fruit). Line drawing: Diggs et al. (1999), p. 699.

**Trifolium dubium* Sibth. Small hop-clover. Naturalized annual. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 703.

**Vicia ludoviciana* Nutt. subsp. *leavenworthii* (T. & G.) Lasseter & Gunn [*Vicia leavenworthii* T. & G.] Leavenworth vetch. Native annual herbaceous vine. Rare in riparian woodlands and old fields. Line drawing: Diggs et al. (1999), p. 709.

**Wisteria sinensis* (Sims) Sweet. Chinese wisteria. Introduced woody vine. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 709.

Fagaceae Beech Family

**Quercus buckleyi* Nixon & Dorr [*Quercus texana* of Correll & Johnston (1970), not Buckl. Texas oak, Spanish oak. Introduced tree, native elsewhere in Texas but apparently not in the Missions area, where naturally-occurring oaks of all sorts are scarce or essentially absent. Newly-planted small trees at Mission Espada, Mission San Juan, in the San Juan Woodland landscape, and at various other sites may be this species; *Quercus shumardii* Buckl. could also be present. Photo: SAM-942. Line drawing: Diggs et al. (1999), p. 715.

Quercus macrocarpa Michx. Bur oak. Introduced tree, native to other parts of Texas. At least two trees planted in landscape on E side of new channel of San Antonio River near fenced compound around stone building on San Juan Dam Tract; this site may lie on property of the San Antonio River Authority rather than the National Park Service. Photo: SAM-1003. Line drawing: Diggs et al. (1999), p. 715.

Quercus muhlenbergii Engelm. Chinkapin oak. Introduced tree, native to other parts of Texas. Several trees planted in landscape on E side of new channel of San Antonio River near fenced compound around stone building on San Juan Dam Tract; this site may lie on property of the San Antonio River Authority rather than the National Park Service. Photo: SAM-1004. Line drawing: Diggs et al. (1999), p. 717.

Quercus polymorpha Schlect. & Cham. Monterrey oak. Introduced tree. Small trees recently planted in landscapes at Mission Concepción, Mission San José and Mission Espada. Photo: SAM-155.

**Quercus virginiana* Mill. Live oak. Presumably native tree. Occasional in cultivated landscapes around some missions; rare in the natural landscape in riparian woodlands and as seedlings in old fields. Voucher: Carr 21066. Photo: SAM-977. Line drawing: Diggs et al. (1999), p. 721. The identity of these plants is problematic; if native, they may be *Quercus virginiana* Mill. var. *virginiana*, *Quercus virginiana* Mill. var. *fusiformis* (Small) Sarg., or members of a hybrid swarm. If introduced, they could be any number of species.

Fumariaceae Fumitory Family

**Corydalis curvisiliqua* Engelm. var. *curvisiliqua*. Scrambled eggs. Native annual. Occasional in old fields and riparian woodlands; reported by Van Auken (1981) from Mission San José. Voucher: Carr 20454. Photo: SAM-597. Line drawing: Diggs et al. (1999), p. 721.

Fumaria officinalis L. Common fumitory. Naturalized annual. Occasional on mown lawns of missions. Voucher: Carr 20445. Photo: SAM-571. Line drawing: Diggs et al. (1999), p. 725.

Garryaceae Silk-tassel Family

**Garrya ovata* Benth. subsp. *lindheimeri* (Torr.) Dahling [*Garrya lindheimeri* Torr.] Lindheimer silk-tassel. Native shrub. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 725.

Geraniaceae Geranium Family

Erodium cicutarium (L.) L'Hér. Pin clover, alfilaria. Naturalized annual. Common winter weed of mission lawns. Voucher: Carr 20539. Photo: SAM-566, SAM-567, SAM-709. Line drawing: Diggs et al. (1999), p. 731.

**Erodium texanum* Gray. Texas stork's-bill. Native annual. Curiously rare in area, noted only on lawn at Mission Concepción. Voucher: Carr 20538. Photo: SAM-566, SAM-567. Line drawing: Diggs et al. (1999), p. 731.

**Geranium carolinianum* L. Carolina wild-geranium. Native annual. Occasional on mission lawns, in old fields and various disturbed sites. Voucher: Carr 20468. Photo: SAM-672. Line drawing: Diggs et al. (1999), p. 731.

Hydrocharitaceae Frog's-bit Family

Hydrilla verticillata (L. f.) Royle. Hydrilla. Naturalized submersed aquatic perennial; a "federally listed" noxious weed. Local in Acequia de Espada ca. 500 ft. S of Ashley Rd., where it is mixed with *Ceratophyllum demersum*. Vouchers: Carr 19791, Carr 21132. Photo: SAM-939. Line drawing: Diggs et al. (1999), p. 1171.

Hydrophyllaceae Waterleaf Family

Nama jamaicense L. Fiddleleaf nama. Native annual. Occasional on mission lawns, in old fields, on roadbeds, and in openings in various woodlands. Voucher: Carr & Benesh 20921. Photo: SAM-235, SAM-702. Line drawing: Diggs et al. (1999), p. 745.

**Nemophila phacelioides* Nutt. Blue eyes. Native annual. Common in riparian woodlands. Voucher: Carr 20461. Photo: SAM-582, SAM-583, SAM-604, SAM-688, SAM-689. Line drawing: Diggs et al. (1999), p. 745.

**Phacelia congesta* Hook. Blue curls. Native annual. Occasional in and along margins of riparian and upland woodlands. Voucher: Carr & Carré 20784-B. Photo: SAM-828. Line drawing: Diggs et al. (1999), p. 745.

Iridaceae Iris Family

**Iris* sp. Iris. Introduced perennial. A few plants in garden at Mission Concepción during 1991; removed during summer 2002. Reported by Van Auken (1981) from Mission Espada. Photo: SAM-978.

Sisyrinchium langloisii Greene [incl. *Sisyrinchium pruinosum* Bickn.] Blue-eyed grass. Native perennial. Rare in old field at 9243 Villamain. Voucher: Carr 20468. Photo: SAM-674. Line drawing: Diggs et al. (1999), p. 1777.

Juglandaceae Walnut Family

**Carya illinoinensis* (Wang) K. Koch. Pecan. Native tree. Common in riparian and upland woodlands; a principal shade tree of parks along San Antonio River where all competing trees have been removed. Voucher: Carr & Benesh 20915. Photo: SAM-212. Line drawing: Diggs et al. (1999), p. 751.

**Juglans nigra* L. Black walnut. Native tree. Reported by Van Auken (1981) from all mission sites. Noted during these surveys on slope NE of Mission Espada, where large old trees are fairly common in a somewhat natural habitat; fruit on these trees is 4.0 cm in diameter when fresh. A walnut is planted at the NE corner of Mission Concepción; it may or may not be the same species. Voucher: Carr 19877. Photo: SAM-149, SAM-150. Line drawing: Diggs et al. (1999), p. 757.

Juncaceae Rush Family

**Juncus torreyi* Cov. Torrey rush. Native perennial. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1185.

Lamiaceae (Labiatae) Mint Family

Hedeoma drummondii Benth. Limoncillo. Native perennial. Rare in area but locally common in decent grassland remnant at 9243 Villamain Rd. and in openings in upland woodland on N side of I-410 W of river. Vouchers: Carr 20370; Carr 20756. Photo: SAM-530, SAM-1041. Line drawing: Diggs et al. (1999), p. 761.

Hedeoma hispida Pursh. Rough hedeoma. Native annual. Rare in openings in upland woodlands on N side of I-410 immediately W of San Antonio River. Photo: SAM-1010. Line drawing: Diggs et al. (1999), p. 761.

Lamium amplexicaule L. Henbit. Naturalized annual. Occasional winter weed of mission lawns and other disturbed open sites. Voucher: Carr 20453. Photo: SAM-588, SAM-589. Line drawing: Diggs et al. (1999), p. 761.

**Marrubium vulgare* L. Common horehound. Naturalized perennial. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 763.

Monarda citriodora Cerv. var. *citriodora*. Horsemint. Native annual. Common in upland woodlands and old fields. Photos: SAM-854. Vouchers: Carr 19766; Carr 20774; Carr 20908; Carr & Price 20987. Photo: SAM-854. Line drawing: Diggs et al. (1999), p. 767.

**Monarda pectinata* Nutt. Plains beebalm, prostrate pink horsemint. Reported by Van Auken (1981) from three mission sites. This species occurs (in Texas) mostly on the Panhandle and is absent from the south-central Texas. Perhaps the Van Auken record is based on plants that were cultivated in gardens of the time. Line drawing: Diggs et al. (1999), p. 771.

Rosmarinus officinalis L. Rosemary. Introduced shrub. Planted in gardens at Mission Espada, Mission San Juan and Mission San José. Photo: SAM-005, SAM-1024.

**Salvia coccinea* Buch. Scarlet sage, tropical sage. Native annual. Rare on bank of Sixmile (Piedras) Creek at Espada Aqueduct and along margin of strip of hackberry woodland along abandoned acequia segment at Mission Espada. Voucher: Carr 21153. Photo: SAM-437, SAM-836, SAM-1163. Line drawing: Diggs et al. (1999), p. 775.

**Salvia farinacea* Benth. Mealy sage. Native perennial. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 777.

Salvia greggii Gray. Gregg salvia, autumn sage. Introduced shrub/cultivar. Planted in landscapes at Mission Concepción, Mission Espada, and Mission San José. Photo: SAM-025 and SAM-026 (white-flowered form). Line drawing: Diggs et al. (1999), p. 775.

Salvia leucantha Cav. Mexican bush sage. Introduced perennial. Planted in gardens at Mission Espada and Mission San José. Photo: SAM-250.

Salvia sp. Indigo spires. Introduced perennial cultivar. Planted in landscape at Mission San José. Photo: SAM-023, SAM-535.

Scutellaria drummondii Benth. Annual skullcap. Native annual. Rare in old fields. Photo: SAM-635. Line drawing: Diggs et al. (1999), p. 781.

Scutellaria sp. Red skullcap. Introduced perennial. In garden bed at Mission Espada. Photo: SAM-158, SAM-159.

Stachys crenata Raf. Shade betony. Native annual. Rare in upland woodlands. Voucher: Carr & Carré 20782. Line drawing: Diggs et al. (1999), p. 785.

**Teucrium canadense* L. American germander. Native perennial. Rare along E bank of old river channel above old Espada Dam. Voucher: Carr & Benesh 20914. Photo: SAM-859. Line drawing: Diggs et al. (1999), p. 785.

Teucrium cubense Jacq. var. *cubense* [*Trichostema cubense* Jacq. subsp. *chamaedrifolium* (Miller) Epling]. Cuban germander. Native annual. Rare in area, locally frequent in young open hackberry-soapberry woodland in Labores de Espada, at GPS point N29°19.617', W098°27.503' and vicinity. Vouchers: Carr 19891, Carr 21203. Photo: SAM-1043. Line drawing: Diggs et al. (1999), p. 785.

Lemnaceae Duckweed Family

Lemna aequinoctialis. Duckweed. Native annual floating aquatic. Local in Acequia de Espada ca. 500 ft. S of Ashley Rd. and ca. 2000 ft. N of Ashley Rd. Voucher: Carr 19790. Photo: SAM-215, SAM-216. Line drawing: Diggs et al. (1999), p. 1189.

Liliaceae Lily Family

Allium canadense L. var. *canadense*. Canada wild onion. Native perennial. Occasional to locally common in riparian woodlands. Voucher: Carr 20551. Photo: SAM-720, SAM-723. Line drawing: Diggs et al. (1999), p. 1195.

**Asparagus officinalis* L. Asparagus. Introduced perennial. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 1199.

**Cooperia drummondii* Herb. Rain-lily, cebolleta. Native perennial. Common in old fields, athletic fields, mission lawns, etc., after summer rains. Voucher: Carr 20052. Photo: SAM-367, SAM-368, SAM-374, SAM-973. Line drawing: Diggs et al. (1999), p. 1203.

**Cooperia pedunculata* Herb. Rain lily. Native perennial. Occasional in old fields and on mission lawns; rare in riparian woodlands. Photo: SAM-690. Line drawing: Diggs et al. (1999), p. 1203.

Crinum sp. Introduced perennial. Planted in landscape around shaded depression (old quarry pit) on W side of lawn in front of Mission Concepción. Photo: SAM-398, SAM-399. According to flora and fauna binder at visitor center, these plants may be *Crinum x powellii* Hort. ex Bak. A *Crinum* species is also planted at the E edge of the grounds at Mission Espada; perhaps it is the same cultivar.

**Hymenocallis caroliniana* (L.) Herb. Spider-lily. Introduced perennial. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 1205.

Nothoscordum bivalve (L.) Britt. Crow-poison. Native perennial. Occasional in old fields and lawns. Voucher: Carr 21231. Photo: SAM-632, SAM-1095. Line drawing: Diggs et al. (1999), p. 1209.

Unknown Liliaceae. Naturalized perennial. Locally common in riparian woodland along Sixmile (Piedras) Creek from bridge upstream from Espada Aqueduct downstream to hike-and-bike trail. Voucher: Carr 20799.

Lythraceae Loosestrife Family

Ammannia coccinea Rottb. Scarlet ammannia. Native annual. One plant in Acequia de Espada at culvert under Espada Rd. at SW corner of Mission Espada grounds, at N29°19.030', W098°27.087' +/- 13.2 ft. Photo: SAM-010. Line drawing: Diggs et al. (1999), p. 801.

**Lagerstroemia indica* L. Crape myrtle. Introduced shrub. Planted on grounds of Mission San José. One shrub, either an escape or a very old planting, in woodland on bank of Acequia de San Juan on San Juan Dam tract. Photo: SAM-011. Line drawing: Diggs et al. (1999), p. 801.

Malpighiaceae Malpighia Family

Malpighia glabra L. Barbados cherry, manzanita. Introduced shrub. One large individual (ca. 2 meters tall) along interior west wall of mission compound, at N29°21.716', W098°28.848' +/- 20.1 ft. Photos: SAM-351, SAM-352, SAM-906.

Mascagnia sp. Purple orchid vine. Introduced woody vine. Climbing on trellis in front of visitor center at Mission Concepción. Flora and fauna booklet at visitor center identifies this species as *Miscagnia lilacina* [authorship unknown]. Photo: SAM-925, SAM-1110.

Malvaceae Mallow Family

**Abutilon fruticosum* Guillemin & Perrottet [*Abutilon incanum* (Link.) Sweet]. Texas Indian-mallow. Native perennial. Occasional in upland woodlands and old fields. Vouchers: Carr 19838, Carr 19852. Photo: SAM-533. Line drawing: Diggs et al. (1999), p. 803.

**Callirhoe leiocarpa* Martin. Poppy mallow, wine-cups. Native annual. Common in upland woodlands; reported by Van Auken (1981) from Mission Espada. Voucher: Carr & Carré 20785. Photo: SAM-732, SAM-827. Line drawing: Diggs et al. (1999), p. 809.

**Malva parviflora* L. Cheeseweed, little mallow. Naturalized annual. Common weed in mission lawns and old fields. Voucher: Carr 20457. Photo: SAM-593, SAM-594, SAM-595, SAM-722. Line drawing: Diggs et al. (1999), p. 813.

**Malvastrum coromandelianum* (L.) Gke. Threelobe false-mallow. Native perennial. Common in lawns, old fields and athletic fields. Voucher: Carr 20900. Photo: SAM-007, SAM-262, SAM-263. Line drawing: Diggs et al. (1999), p. 813.

**Malvaviscus arboreus* Cav. var. *drummondii* (T. & G.) Schery. Turk's cap. Native perennial. Occasional to locally common in riparian woodlands; occasional in upland woodlands. Voucher: Carr & Benesh 21053. Photo: SAM-003, SAM-004. Line drawing: Diggs et al. (1999), p. 817.

Pavonia lasiopetala Scheele [*Pavonia wrightii* Gray]. Rose pavonia. Shrub native to western Texas, introduced in Missions area. Planted in landscapes at Mission Concepción and Mission San José; no naturally-occurring (wild) plants seen. Photo: SAM-162, SAM-163, SAM-164, SAM-165, SAM-166. Line drawing: Diggs et al. (1999), p. 819.

**Rhynchosida physocalyx* (Gray) Fryxell [*Sida physocalyx* Gray]. Spearleaf sida. Native perennial. Common in lawns and old fields. Vouchers: Carr 19826, Carr 20724. Photo:

SAM-093, SAM-094, SAM-297, SAM-298, SAM-795. Line drawing: Diggs et al. (1999), p. 819.

**Sida abutifolia* H. B. K. [*Sida filicaulis* T. & G.]. Creeping yellow sida. Native perennial. Occasional but omnipresent in mown lawns, athletic fields, old fields and other open areas. Voucher: Carr 19869. Photo: SAM-329, SAM-1033. Line drawing: Diggs et al. (1999), p. 819.

Sida spinosa L. Prickly sida. Native perennial. Rare in old fields and upland woodlands. Vouchers: Carr 19820, Carr 20108. Photos: SAM-987, SAM-988. Line drawing: Diggs et al. (1999), p. 819.

Meliaceae Mahogany Family

**Melia azedarach* L. Chinaberry. Naturalized tree. Common in riparian and upland woodlands; also planted in landscapes at missions. A current target of control measures on property of NPS; hundreds of trees were cut during the course of this survey. Voucher: Carr 20742. Photo: SAM-395, SAM-396, SAM-805. Line drawing: Diggs et al. (1999), p. 825.

Menispermaceae Moonseed Family

Cocculus carolinus (L.) DC. Carolina snailseed. Native woody vine. Common in riparian and upland woodlands. Voucher: Carr & Benesh 19812. Photo: SAM-236, SAM-237, SAM-240, SAM-427. Line drawing: Diggs et al. (1999), p. 825.

Cocculus diversifolius DC. Orientvine, correhuela. Native woody vine. Locally common in shrubs on grounds of Mission San José. A species of deep South Texas and northern Mexico, the occurrence of which in the Missions area is rather curious, perhaps a result of introduction with landscape plants. Vouchers: Carr 19777, Carr 19832. Photo: SAM-280, SAM-281.

Moraceae Mulberry Family

**Broussonetia papyrifera* (L.) Vent. Paper mulberry. Naturalized tree. Locally common in woodland along E side of South Presa St. just N of Graf Rd.; rare in woodland along N margin of Mission Espada. Voucher: Carr 19895. Photo: SAM-307, SAM-308, SAM-309. Line drawing: Diggs et al. (1999), p. 829.

Fatoua villosa (Thunb.) Nakai. [No common name.] Introduced annual. Weed in garden beds at Mission Concepción and Mission Espada. Vouchers: Carr 19774, Carr 19878. Photo: SAM-160, SAM-161. Line drawing: Diggs et al. (1999), p. 829.

**Ficus carica* L. Common fig. Naturalized shrub. Occasional in landscapes around missions; escaped into riparian woodlands at various spots. Voucher: Carr 20897. Photos: SAM-151, SAM-152, SAM-853. Line drawing: Diggs et al. (1999), p. 829.

**Morus alba* L. White mulberry, Asian mulberry. Naturalized tree. Common in riparian woodlands; occasional in upland woodlands. Voucher: Carr 19800. Photo: SAM-170, SAM-174. Line drawing: Diggs et al. (1999), p. 833.

**Morus rubra* L. Red mulberry. Native tree. Although most of the mulberries in the project area to be the exotic *Morus alba*, a few seem to be the native *Morus rubra*. Voucher: Carr 20812. Photo: SAM-1147. Line drawing: Diggs et al. (1999), p. 833.

Myricaceae Wax-myrtle Family

Myrica sp. Wax-myrtle. Introduced shrub. Planted in landscape at Mission San José. According to flora and fauna binder in visitor center, this is dwarf wax-myrtle (*Myrica pusilla* Raf.). Photo: SAM-029, SAM-030.

Nyctaginaceae Four-o'clock Family

Acleisanthes longiflora Gray. Angel trumpets. Native perennial. Rare in area, noted in cleared grassy area along W side of hike & bike trail immediately N of Mission Espada and in upland woodland N of I-410 nearby. Voucher: Carr 21232. Photo: SAM-489, SAM-1098.

Acleisanthes obtusa (Choisy) Standl. Berlandier trumpets. Native perennial. Locally common in compacted soil in barish spots in lawn on east side of Mission Espada complex; rare to locally common in upland woodlands. Vouchers: Carr 19880, Carr & Gallyoun 20352. Photo: SAM-156, SAM-157, SAM-459, SAM-460, SAM-461, SAM-463, SAM-511, SAM-512.

**Boerhavia diffusa* L. [*Boerhavia coccinea* Mill.] Scarlet spiderling. Native perennial. Common weed in lawns, athletic fields, old fields and other open disturbed sites. Voucher: Carr 19862. Photos: SAM-392, SAM-1078. Line drawing: Diggs et al. (1999), p. 837.

Boerhavia erecta L. Erect spiderling. Native annual. Relatively rare in area, occurring mostly as a wide of cracks in pavement of streets and sidewalks. Voucher: Carr 19819. Photos: SAM-1079, SAM-1080. Line drawing: Diggs et al. (1999), p. 841.

Bougainvillea sp. Bougainvillea. Introduced shrub. Planted in landscape at Mission San Juan; apparently died during winter of 2002. Also in pots at Mission Espada. Photo: SAM-1023.

Mirabilis albida (Walt.) Heimerl. Whitestem four'clock. Native perennial. Rare in area, encountered only in upland woodland on N side of I-410 immediately W of hike & bike trail on W side of river. Voucher: Carr 21192. Photo: SAM-1020, SAM-1021. Line drawing: Diggs et al. (1999), p. 841.

**Mirabilis jalapa* L. [*Mirabilis lindheimeri* (Standl.) Shinners]. Common four-o'clock. Naturalized perennial. Occasional in riparian and upland woodlands and along woodland margins; also planted in landscapes around missions (e.g., at Mission San José). Voucher: Carr 21101. Photo: SAM-503, SAM-504. Line drawing: Diggs et al. (1999), p. 843.

Mirabilis linearis (Pursh) Heimerl. Slenderleaf four-o'clock, umbrella-wort. Native perennial. Locally frequent in old field on San Juan Dam Tract. Voucher: Carr 19843. Photo: SAM-084, SAM-085, SAM-086, SAM-369. Line drawing: Diggs et al. (1999), p. 843.

**Nyctaginea capitata* Choisy. Scarlet muskflower. Native perennial. Occasional but unduly conspicuous (when flowering) in old fields and upland woodlands. Voucher: Carr 19763. Photo: SAM-014, SAM-015, SAM-016, SAM-017, SAM-103, SAM-104, SAM-105, SAM-106. Line drawing: Diggs et al. (1999), p. 843.

Oleaceae Olive Family

**Forestiera angustifolia* Torr. Panalero, narrowleaf elbowbush, desert olive. Reported by Van Auken (1981) from Espada / Acequia Park.

Fraxinus berlandieriana DC. Fresno, ash. Native tree. Occasional in riparian woodlands. Voucher: Carr 19799. Photo: SAM-847.

Fraxinus velutina Torr. Arizona ash. Introduced tree. Planted in landscape at Mission San José. Photo: SAM-882.

Jasmimum mesnyi Hance. Yellow jasmine, primrose jasmine. Introduced shrub. Several large shrubs planted in a row on southeast side of church at Mission San José, at N29°21.725', W098°28.784' +/- 14.4 ft. Photo: SAM-346.

Ligustrum japonicum Thunb. Japanese ligustrum, waxleaf ligustrum. Naturalized shrub. Common in riparian and upland woodlands; also utilized in landscapes around missions. Voucher: Carr 19797. Photo: SAM-394. Line drawing: Diggs et al. (1999), p. 851.

**Ligustrum quihoui* Carrière. Ligustrum. Naturalized shrub. Reported by Van Auken (1981) from four mission sites. Line drawing: Diggs et al. (1999), p. 851.

Ligustrum sinense Lour. Chinese ligustrum. Naturalized shrub. Rare in riparian woodlands. Voucher: Carr 21094. Photo: SAM-915. Line drawing: Diggs et al. (1999), p. 851.

**Menodora heterophylla* (Moric.) DC. Redbud menodora. Native perennial. Occasional in openings in upland woodlands and in old field on San Juan Dam Tract; reported by Van Auken (1981) from Mission San José. Voucher: Carr 20728. Photo: SAM-756, SAM-802, SAM-803. Line drawing: Diggs et al. (1999), p. 853.

Onagraceae Evening-Primrose Family

Gaura coccinea Pursh. Scarlet gaura. Native perennial. Frequent in upland woodlands and old fields. Vouchers: Carr 19767, Carr 19831, Carr 19860. Photo: SAM-069, SAM-070, SAM-071. Line drawing: Diggs et al. (1999), p. 857.

**Gaura drummondii* (Spach) T. & G. [*Gaura odorata* Lag.]. Wild honeysuckle. Native annual. Reported by Van Auken (1981) from four mission sites. Line drawing: Diggs et al. (1999), p. 857.

**Gaura parviflora* Doug. Smallflower gaura. Native annual. Common in upland woodlands; occasional in old fields. Vouchers: Carr 19867; Carr 20745. Photo: SAM-790. Line drawing: Diggs et al. (1999), p. 857.

Gaura sinuata Nutt ex. Ser. Wavyleaf gaura. Native perennial. Frequent in same habitats as *Gaura coccinea*, but blooming earlier in season. Vouchers: Carr 20726, Carr 20910. Line drawing: Diggs et al. (1999), p. 857.

Ludwigia octovalvis (Jacq.) Raven. Tall water-primrose. Native annual. Occasional along acequias and old river channels. Voucher: Carr 20098. Photo: SAM-415, SAM-1031, SAM-1084. Line drawing: Diggs et al. (1999), p. 861.

Oenothera rosea Ait. Evening-primrose. Native annual. Rare on mudflat along impoundment behind old Espada Dam in Espada Park. Voucher: Carr 20546. Photo: SAM-716.

**Oenothera speciosa* Nutt. Pink evening-primrose. Native perennial. Occasional in old fields and upland woodlands. Voucher: Carr 20727. Photo: SAM-673. Line drawing: Diggs et al. (1999), p. 867.

Oenothera triloba Nutt. Stemless evening-primrose. Native perennial. Occasional on exterior lawns at Mission San José and Mission Espada; numerous plants in northwest corner of lawn at Mission Concepción. Voucher: Carr 20554. Photo: SAM-572. Line drawing: Diggs et al. (1999), p. 867.

Oxalidaceae Wood-Sorrel Family

**Oxalis dillenii* Jacq. [*Oxalis stricta* L.] Yellow sour-clover. Native annual. Occasional in upland woodlands and old fields. Voucher: Carr 20750. Photo: SAM-393. Line drawing: Diggs et al. (1999), p. 871.

Oxalis drummondii Gray. Drummond wood-sorrel. Native perennial. Locally common in shaded lawns at Mission San Juan and Mission Espada. Voucher: Carr 20072. Photo: SAM-402, SAM-403, SAM-1092. Line drawing: Diggs et al. (1999), p. 871.

Oxalis sp. Wood-sorrel. Native perennial. Locally common under anacuas around old quarry pit at Mission Concepción.

Papaveraceae Poppy Family

**Argemone albiflora* Hornem. subsp. *texanum* Ownbey. White prickly-poppy. Native annual or biennial. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 875.

Argemone aurantiaca G. Ownbey. Hill prickly-poppy. Native annual or biennial. Occasional in old fields and other dry open disturbed sites. Voucher: Carr 19829. Photo: SAM-111, SAM-112. Line drawing: Diggs et al. (1999), p. 875.

Passifloraceae Passionflower Family

Passiflora foetida L. var. *gossypifolia* (Desv. ex Hamilt.) Masters. Corona de Cristo, white passionflower. Native annual vine. Occasional along margins of upland woodlands and in athletic fields at Mission San José and W of Mission Concepción. In flower and early fruit, 1 August 2001; flowers closed at noon. Voucher: Carr 19873. Photo: SAM-118, SAM-119, SAM-397, SAM-1034, SAM-1106.

**Passiflora incarnata* L. Blue passionflower, maypop, passionaria. Native perennial herbaceous vine. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 879.

Passiflora tenuiloba Engelm. Spread-lobe passionflower, albatross passionflower. Native perennial herbaceous vine. Apparently rare in area, noted only in older-growth thornscrub at S end of Labores de Espada. Photo: SAM-739. Line drawing: Diggs et al. (1999), p. 879.

Phytolaccaceae Pokeweed Family

**Phytolacca americana* L. Pokeweed. Native annual. Reported by Van Auken (1981) from Mission Concepción. Line drawing: Diggs et al. (1999), p. 885.

**Rivina humilis* L. Pigeonberry. Native perennial. Occasional in riparian woodland along Acequia de Espada N of Ashley Rd.; also in gardens at some missions, where apparently planted. Vouchers: Carr 20924; Carr 21149. Photo: SAM-400, SAM-401, SAM-425, SAM-426. Line drawing: Diggs et al. (1999), p. 885.

Plantaginaceae Plantain Family

**Plantago major* L. Major plantain. Naturalized perennial. Rare on E bank of old river channel above old Espada Dam; during 2001-2002, the one or two plants in this area were repeatedly trampled by fishermen, rendering impossible the collection of a useful voucher specimen. Vegetative rosettes observed in March and April 2002 along the San Antonio River near Mission disappeared before flowering. San Juan Photo: SAM-858. Line drawing: Diggs et al. (1999), p. 887.

**Plantago rhodosperma* Dcne. Redseed plantain. Native annual. Occasional in old fields and upland woodlands. Voucher: Carr 20797. Photo: SAM-700. Line drawing: Diggs et al. (1999), p. 887.

Platanaceae Plane-tree Family

**Platanus occidentalis* L. Eastern sycamore. Native tree. Essentially absent from area. Reported by Van Auken (1981) from Mission San José; not seen in 2001-2002. Several recently-planted small tree were observed in 2001 along San Antonio River near San Juan Dam; these trees were dead by fall 2002. Line drawing: Diggs et al. (1999), p. 889.

Poaceae (Gramineae) Grass Family

**Aristida purpurea* Nutt. var. *purpurea*. Purple threeawn. Native perennial. Occasional in old fields and compacted soils of athletic fields and missions grounds. Vouchers: Carr 19804, Carr 20380. Photo: SAM-922. Line drawing: Diggs et al. (1999), p. 1245.

**Aristida purpurea* Nutt. var. *longiseta* (Steud.) Vasey [*Aristida longiseta* Steud.]. Longawn threeawn. Native perennial. Occasional in old fields; reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 1245.

**Aristida purpurea* Nutt. var. *wrightii* (Nash) Allred [*Aristida wrightii* Nash]. Wright threeawn. Native perennial. Reported by Van Auken (1981) from three mission sites. Line drawing: Diggs et al. (1999), p. 1245.

**Arundo donax* L. Giant cane. Naturalized perennial. Common on banks of waterways and in riparian woodlands. Voucher: Carr & Benesh 21353. Photo: SAM-937, SAN-1158. Line drawing: Diggs et al. (1999), p. 1245.

Avena sativa L. Oats. Introduced annual. Occasional volunteer in old field S of Mission San Juan. Voucher: Carr 20775. Photo: SAM-796. Line drawing: Diggs et al. (1999), p. 1249.

**Bothriochloa ischaemum* (L.) Keng var. *songarica* (Rupr.) Celerier & Harlan. King Ranch bluestem. Naturalized perennial. Planted in athletic fields and lawns around some missions; locally common in some old fields. Voucher: Carr 20375. Photo: SAM-969. Line drawing: Diggs et al. (1999), p. 1249.

**Bothriochloa laguroides* (DC.) Herter subsp. *torreyana* (Steud.) Allred & Gould [*Bothriochloa saccharoides* (Sw.) Rydb. var. *torreyana* (Steud.) Gould]. Silver bluestem. Native perennial. Occasional along margins of upland woodlands, in old fields, athletic fields and lawns. Voucher: Carr 20923. Photo: SAM-534. Line drawing: Diggs et al. (1999), p. 1249.

Bouteloua curtipendula (Michx.) Rydb. Sideoats grama. Native perennial. Rare in area, a few plants at edge of garden in front of visitor center at Mission San José, at GPS point N29°21.622', W098°28.803' +/- 12.7 ft. Perhaps introduced with garden stock. Photos: SAM-344, SAM-345. Line drawing: Diggs et al. (1999), p. 1249.

**Bromus catharticus* Vahl [*Bromus unioloides* (Willd.) Kunth]. Rescuegrass. Naturalized annual. Common in all habitats, one of the most ubiquitous elements of the spring flora. Voucher: Carr 20809. Photo: SAM-678. Line drawing: Diggs et al. (1999), p. 1251.

Bromus japonicus Thunb. ex Murr. Japanese brome. Naturalized annual. Occasional in old fields and upland woodlands. Voucher: Carr & Carré 20784. Line drawing: Diggs et al. (1999), p. 1255.

Buchloe dactyloides (Nutt.) Engelm. Buffalograss. Native perennial. Occasional in old field on San Juan Dam Tract and on lawn at Mission Espada. Voucher: Carr 20740. Photo: SAM-1045, SAM-1139. Line drawing: Diggs et al. (1999), p. 1255.

**Cenchrus spinifex* Cav. [*Cenchrus incertus* Curtis]. Sandburgrass. Native perennial. Occasional in lawns and old fields. Voucher: Carr & Price 20989. Photo: SAM-452, SAM-999. Line drawing: Diggs et al. (1999), p. 1255.

**Chasmanthium latifolium* (Michx.) Yates. Creek oats, inland sea oats. Native perennial. Occasional to common in riparian woodlands. Voucher: Carr 20898. Photo: SAM-125. Line drawing: Diggs et al. (1999), p. 1257.

Chloris ciliata Sw. Fringed chloris. Native perennial. Occasional in upland woodlands. Vouchers: Carr 20106; Carr 20378; Carr 21205. Photo: SAM-1061.

Chloris cucullata Bisch. Hooded windmillgrass. Native perennial. Occasional in lawns, old fields and upland woodlands. Voucher: Carr 19805. Photo: SAM-153, SAM-154, SAM-453. Line drawing: Diggs et al. (1999), p. 1257.

**Chloris x subdolichostachya* Mueller [*Chloris cucullata x Chloris verticillata*] Windmillgrass. Native perennial. Reported by Van Auken (1981) from Mission Espada. Line drawing: Diggs et al. (1999), p. 1257.

Chloris verticillata Nutt. Tumble windmillgrass. Native perennial. Occasional in openings in upland woodlands. Voucher: Carr 20095. Photo: SAM-1063. Line drawing: Diggs et al. (1999), p. 1257.

**Cynodon dactylon* (L.) Pers. var. *dactylon*. Bermudagrass. Naturalized perennial. The common lawn grass throughout; also seeded in hay meadows (old fields), persisting as these fields succeed to mesquite woodlands. Voucher: Carr 20895. Photo: SAM-033. Line drawing: Diggs et al. (1999), p. 1261.

Dichanthium annulatum (Forsk.) Stapf. var. *annulatum*. Kleberg bluestem. Naturalized perennial. Planted on cleared slopes along San Antonio River and escaped into upland woodlands and old fields. Vouchers: Carr 19828, Carr 20054. Photo: SAM-067, SAM-068, SAM-381, SAM-956. Line drawing: Diggs et al. (1999), p. 1265.

Dichanthium aristatum Stapf. Angleton bluestem. Naturalized perennial. Rare in area, noted only on bank of Acequia de Espada at W edge of grounds of Mission Espada. Voucher: Carr 21278. Photo: SAM-1122.

Dichanthium sericeum (R. Br.) A. Camus. Silky bluestem. Naturalized perennial. Occasional in old fields. Voucher: Carr 20369. Photo: SAM-362, SAM-363, SAM-531.

Digitaria ciliaris (Retz.) Koel. [*Digitaria adscendens* (H.B.K.) Henrard]. Southern crabgrass. Naturalized perennial. Rare in area, a few plants at edge of garden in front of visitor center at Mission San José. Voucher: Carr 21128. Photo: SAM-929. Line drawing: Diggs et al. (1999), p. 1265.

Digitaria cognata (Schult.) Pilger subsp. *cognata* [*Leptoloma cognatum* (Schult.) Chase]. Fall witchgrass. Native perennial. Rare in old fields. Voucher: Carr 20367. Photo: SAM-950. Line drawing: Diggs et al. (1999), p. 1265.

Echinochloa colona (L.) Link. Junglerice. Naturalized annual. Weed in garden beds at Mission Espada. Line drawing: Diggs et al. (1999), p. 1267.

Echinochloa crus-galli (L.) Beauv. Barnyardgrass. Naturalized annual. Occasional on banks of acequias and in drier disturbed sites. Photo: SAM-028. Line drawing: Diggs et al. (1999), p. 1267.

Echinochloa walteri (Pursh) Heller. Walter's echinochloa. Native annual. Rare in area, noted only on bank of Acequia de Espada ca. 1/2 mi N of Ashley / Mission Rd. Voucher: Carr & Benesh 21350. Photo: SAM-1154. Line drawing: Diggs et al. (1999), p. 1267.

Eleusine indica (L.) Gaertn. Goosegrass. Naturalized annual. Weed in lawn at Mission Concepción, Mission Espada and Mission San Juan; larger plants occasional along old river channel at Espada Park. Voucher: Carr 19773; Carr 19883. Photo: SAM-1126. Line drawing: Diggs et al. (1999), p. 1267.

**Elymus canadensis* L. Canada wild-rye. Native perennial. Reported by Van Auken (1981) from five mission tracts; not observed during surveys of 2001-2002. Line drawing: Diggs et al. (1999), p. 1271.

Elymus virginicus L. var. *virginicus*. Virginia wildrye. Native perennial. Frequent in riparian woodlands. Voucher: Carr 20767. Photos: SAM-764, SAM-765. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis barrelieri Daveau. Mediterranean lovegrass. Naturalized annual. Local in unpaved roadbeds and other unshaded sites offering minimal competition. Voucher: Carr 19853. Photo: SAM-1053. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis curtipedicellata Buckl. Gummy lovegrass. Native perennial. Rare in old fields. Voucher: Carr 21177. Photo: SAM-1002. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis intermedia A. S. Hitchc. Plains lovegrass. Native perennial. Occasional in old fields. Vouchers: Carr 20374; Carr 21124; Carr 21178; Carr 21188. Photos: SAM-923, SAM-

1057. Line drawing: Diggs et al. (1999), p. 1273. Some of these specimens approach *Eragrostis hirsuta* (Michx.) Nees (bigtog lovegrass), another native perennial.

**Hordeum pusillum* Nutt. Little barley, southwestern barley. Native annual. Common in old fields and on mission lawns. Voucher: Carr 20721. Photo: SAM-787. Line drawing: Diggs et al. (1999), p. 1279.

Hordeum leporinum L. Hare barley. Naturalized annual. Noted only on lawn within compound at Mission San Juan. Voucher: Carr 20765. Photo: SAM-820. Line drawing: Diggs et al. (1999), p. 1279.

Leersia oryzoides (L.) Swartz. Rice cut-grass. Native perennial. Rare in area, noted only along margin on impoundment upstream from Old Espada Dam. Voucher: Carr & Gallyoun 20354. Photo: SAM-863. Line drawing: Diggs et al. (1999), p. 1283.

Leptochloa dubia (Kunth) Nees. Green sprangletop. Native perennial. Apparently rare in area, noted only on embankment along hike & bike trail along W side of San Antonio River ca. 0.2 trailmiles N of I-410 bridges, where perhaps seeded. Voucher: Carr 21233. Photo: SAM-1099, SAM-1143. Line drawing: Diggs et al. (1999), p. 1283.

Leptochloa mucronata (Michx.) Kunth [*Leptochloa filiformis* (Lam.) Beauv.] Red sprangletop. Native annual. Rare in area, noted only in old field at 9243 Villamain. Voucher: Carr 21228. Photo: SAM-1091. Line drawing: Diggs et al. (1999), p. 1283.

Limnodea arkansana (Nutt.) L. H. Dewey. Ozarkgrass. Native annual. Ubiquitous during spring, common in old fields and lawns but also in shaded woodland sites. Voucher: Carr 20725. Photo: SAM-730. Line drawing: Diggs et al. (1999), p. 1283.

**Lolium perenne* L. [*Lolium multiflorum* Lam.] English rye. Naturalized annual or perennial. Seeded along San Antonio River and escaping into upland and riparian woodlands. Voucher: Carr 20790. Line drawing: Diggs et al. (1999), p. 1285.

Miscanthus sp. Fountain grass, maiden grass. Introduced perennial. Planted in landscapes at Mission Concepción and Mission San José. According to flora and fauna booklet at visitor center, these plants are *Miscanthus sinensis* Anderss. Photo: SAM-021, SAM-022. Line drawing: Diggs et al. (1999), p. 1285.

Muhlenbergia lindheimeri Hitchc. Lindheimer muhly. Native perennial. Planted in landscape at Mission San José; no naturally-occurring (wild) plants observed. Photo: SAM-246. Line drawing: Diggs et al. (1999), p. 1287.

**Nassella leucotricha* (Trin. & Rupr.) Pohl [*Stipa leucotricha* Trin. & Rupr.]. Texas wintergrass, speargrass. Native perennial. Common in upland woodlands and some old fields. Voucher: Carr 20722. Photo: SAM-971. Line drawing: Diggs et al. (1999), p. 1289.

Panicum antidotale Retz. Blue panicum. Naturalized perennial. Rare in area, noted only along hike and bike trail on E side of Labores de Espada. Voucher: Carr 21204. Photo: SAM-1060. Line drawing: Diggs et al. (1999), p. 1297.

Panicum capillare L. Witchgrass. Native annual. Rare in area, noted only in unshaded bed of access road along acequia de Espada N of Ashley / Mission Rd. after dredging operation of 2002. Voucher: Carr & Benesh 21351. Photo: SAM-1155. Line drawing: Diggs et al. (1999), p. 1299.

Panicum dichotomiflorum Michx. Spreading witchgrass. Native annual. Occasional along margins of riparian woodlands. Voucher: Carr & Gallyoun 20356. Photo: SAM-499, SAM-500. Line drawing: Diggs et al. (1999), p. 1299.

**Panicum hallii* Vasey. Hall's panicum. Native perennial. Occasional to locally common in old fields and upland woodlands. Vouchers: Carr 20053; Carr 20107; Carr 20372; Carr 20373; Carr 21175. Photo: SAM-370. Line drawing: Diggs et al. (1999), p. 1301. Some specimens may be *Panicum hallii* var. *filipes* (Scribn.) Waller [*Panicum diffusum* Swartz], which was reported from Espada / Acequia Park by Van Auken (1981).

Panicum maximum Jacq. Guineagrass. Naturalized perennial. Several colonies: on recently regraded clay slope along new street that crosses San Antonio River immediately E of

Mission Espada, ca. 2000 ft. S of I-410 bridge, at N29°19.127', W098°26.947'; in upland woodland along W side of Acequia de Espada ca. 100 ft. N of Ashley Rd.; another colony along margin of riparian woodland along old river channel below Old Espada Dam. Vouchers: Carr & Benesh 19816; Carr 20096. Photo: SAM-1060.

**Panicum oligosanthes* Schult. [*Dichanthelium oligosanthes* (Scribn.) Gould]. Fewflower panicgrass. Native perennial. Rare in riparian woodlands. Vouchers: Carr 20819 (vernal form); Carr & Benesh 21357 (autumnal form). Line drawing: Diggs et al. (1999), p. 1303.

**Paspalum dilatatum* Poir. Dallisgrass. Naturalized perennial. Occasional weed in lawns and old fields. Voucher: Carr 19854. Photo: SAM-197, SAM-198. Line drawing: Diggs et al. (1999), p. 1307.

Paspalum distichum L. Knotgrass. Native perennial. Local on flat along San Antonio River near San Juan Dam, a site that probably lies on property of the San Antonio River Authority rather than the National Park Service. Voucher: Carr 19887. Line drawing: Diggs et al. (1999), p. 1307.

Paspalum langei (Fourn.) Nash. Rustyseed paspalum. Native perennial. Rare in riparian woodlands. Voucher: Carr 20104. Photo: SAM-1047, SAM-1048. Line drawing: Diggs et al. (1999), p. 1307.

Paspalum lividum Trin. Longtom. Native perennial. Locally common on shaded bank of old river channel upstream from Espada Dam in Espada Park. Voucher: Carr 19793. Photo: SAM-945.

Paspalum pubiflorum Fourn. Hairyseed paspalum. Native perennial. Occasional in upland woodlands. Voucher: Carr 20901. Photo: SAM-440. Line drawing: Diggs et al. (1999), p. 1309.

Paspalum urvillei Steud. Vaseygrass. Naturalized perennial. Occasional on banks of waterways. Voucher: Carr 21096. Line drawing: Diggs et al. (1999), p. 1309.

Pennisetum ciliare (L.) Link [*Cenchrus ciliaris* L.]. Buffelgrass. Naturalized perennial. Rare, two plants in crack in asphalt at east end of parking lot at Mission San José, at N29°21.504', W098°28.708' +/- 11.2 ft. Photo: SAM-340.

Pennisetum setaceum (Forsk.) Chiovenda. Purple fountain-grass. Introduced perennial. Planted in gardens at Mission San José. Photos: SAM-061, SAM-062, SAM-063 (all ineligible; taken off-site), SAM-341.

Phyllostachys aurea Carrière ex Rivière & Rivière. Bamboo. Naturalized perennial. Dense stand on E side of Acequia de San Juan on S and W sides of San Juan Dam tract, from GPS point N29°21.426', W098°27.999' to N29°21.379', W098°27.907'. Voucher: Carr 21221. Photo: SAM-386, SAM-387. Line drawing: Diggs et al. (1999), p. 1313.

Poa annua L. Annual bluegrass. Naturalized annual. Common on mission lawns and in old fields; occasional in riparian woodlands. Voucher: Carr 20447. Photo: SAM-580, SAM-581. Line drawing: Diggs et al. (1999), p. 1313.

**Polypogon monspeliensis* (L.) Desf. Rabbitfootgrass. Naturalized annual. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1317.

Schizachyrium scoparium (Michx.) Nash [*Andropogon scoparius* Michx.]. Little bluestem. Native perennial. Rare on properties; locally common in narrow strip of "old field" perhaps not recently plowed, in Labores de San Juan, W side of Villamain Rd. ca. 0.25-0.3 mi S of road to parking lot for Mission San Juan, at GPS point N29°19.735, W098°27.134'. Voucher: Carr 20368. Photo: SAM-526, SAM-527. Line drawing: Diggs et al. (1999), p. 1321.

Setaria leucopila (Scribn. & Merr.) K. Schum. Plains bristlegrass. Native perennial. Occasional in upland woodland and old fields. Voucher: Carr 19806. Photo: SAM-951. Line drawing: Diggs et al. (1999), p. 1321.

**Setaria parviflora* (Poir.) Kerg. [*Setaria geniculata* Beauv.] Knotroot bristlegrass. Native perennial. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1321.

Setaria scheelei (Steud.) Hitchc. Southwestern bristlegrass. Native perennial. Frequent in upland and riparian woodlands. Vouchers: Carr 21134, Carr 21148. Photo: SAM-173, SAM-175, SAM-953. Line drawing: Diggs et al. (1999), p. 1323.

**Setaria viridis* (L.) Beauv. Green bristlegrass, green foxtailgrass. Naturalized annual. Reported by Van Auken (1981) from all mission sites. Line drawing: Diggs et al. (1999), p. 1323.

**Sorghum halepense* (L.) Pers. Johnsongrass. Naturalized perennial. Common in old fields and upland woodlands. Voucher: Carr 20889. Photo: SAM-036, SAM-037. Line drawing: Diggs et al. (1999), p. 1325.

Sorghum sp. Grain sorghum. Naturalized perennial. Occasional in old fields, where presumably seeded. Voucher: Carr 20748.

+*Sporobolus cryptandrus* (Torr.) Gray. Sand dropseed. Native perennial. Rare in old fields and upland woodlands. Vouchers: Carr 20105, Carr 21126. Photo: SAM-921. Line drawing: Diggs et al. (1999), p. 1325.

**Stenotaphrum secundatum* (Walt.) Kuntze. St. Augustine grass. Naturalized perennial. Rare in riparian woodlands, usually simply spreading downslope from sodded park lawn plantings, e.g., at Espada Park. Voucher: Carr 21095. Photo: SAM-1029. Line drawing: Diggs et al. (1999), p. 1331.

Trichloris pluriflora Fourn. [*Chloris pluriflora* (Fourn.) Clayton] Manyflower false-Rhodesgrass. Native perennial. Rare in area, noted only on lawn of Mission San Juan. Voucher: Carr 20073. Photo: SAM-994.

Tridens albescens (Vasey) Woot. & Standl. White tridens. Native perennial. Occasional in old field on San Juan Dam tract. Voucher: Carr 19855. Photo: SAM-798. Line drawing: Diggs et al. (1999), p. 1331.

Tridens eragrostoides (Vasey & Scribn.) Nash. Lovegrass tridens. Native perennial. Rare in area, noted only in dense mesquite-brasil-colubrina shrubland at S end of Labores de Espada, just N of I-410, where locally common. Vouchers: Carr & Gallyoun 20346; Carr 21187; Carr 21234. Photo: SAM-1056.

Tridens muticus (Torr.) Nash var. *elongatus* (Buckl.) Shinners. Rough tridens. Native perennial. Rare in area, noted only in old field on San Juan Dam tract. Voucher: Carr 21276. Photo: SAM-1120. Line drawing: Diggs et al. (1999), p. 1331.

**Tridens texanus* (S. Wats.) Nash. Texas tridens. Native perennial. Occasional in old fields and upland woodlands. Voucher: Carr 21189. Photos: SAM-467, SAM-1058. Line drawing: Diggs et al. (1999), p. 1333.

Urochloa fasciculata (Swartz) Webster [*Brachiaria fasciculata* (Swartz) Parodi; *Panicum fasciculatum* Swartz]. Browntop signalgrass. Native annual. Occasional to locally common in garden beds, old fields and other disturbed sites. Vouchers: Carr 19801, Carr 21198. Photo: SAM-363, SAM-382, SAM-383, SAM-1035. Line drawing: Diggs et al. (1999), p. 1333.

**Zizaniopsis miliacea* (Michx.) Doell. & Asch. Marshmillet. Native perennial. Rare, local on E bank of old river channel ca. 500-1000 ft. upstream from (N of) Old Espada Dam. Voucher: Carr 20789. Photo: SAM-195. Line drawing: Diggs et al. (1999), p. 1341.

Polygonaceae Knotweed Family

Antigonon leptopus Hook. & Arn. Coralvine, queen's wreath, coamecatl. Naturalized perennial herbaceous vine. Planted in several areas (e.g., Mission San José); escaped into San Juan Woodland just W of Mission San Juan and onto curblawns and woodlands S and

NE of Mission San José, as well as in woodland on slope N of Mission Espada. Voucher: Carr 21070. Photo: SAM-509, SAM-510. Line drawing: Diggs et al. (1999), p. 901.

**Polygonum densiflorum* Meisn. [*Persicaria densiflora* (Meisn. Moldenke]. Stout smartweed. Native perennial. Occasional along waterways; locally abundant in Acequia de Espada at Mission Espada, summer 2002. Vouchers: Carr 19788; Carr 19794; Carr 21154. Photo: SAM-962. Line drawing: Diggs et al. (1999), p. 903.

Rumex chrysocarpus Moris. Amanastla, dock. Native perennial. Occasional along acequias and other wet spots. Vouchers: Carr 20764; Carr 20903; Carr 20918. Photos: SAM-196, SAM-821, SAM-849, SAM-850.

**Rumex crispus* L. Curly dock. Naturalized perennial. Reported by Van Auken (1981) from three mission sites. Line drawing: Diggs et al. (1999), p. 907.

**Rumex pulcher* L. Fiddle dock. Naturalized perennial. Rare along acequias; reported by Van Auken (1981) from three mission sites. Voucher: Carr 20919. Line drawing: Diggs et al. (1999), p. 907.

Polemoniaceae Phlox Family

Gilia incisa Benth. Cutleaf gilia. Native perennial. Rare in area, encountered only in upland woodland on N side of I-410 immediately W of hike & bike trail on W side of river. Voucher: Carr 21191. Photo: SAM-728, SAM-1017. Line drawing: Diggs et al. (1999), p. 889.

Pontederiaceae Pickerelweed Family

**Eichhornia crassipes* (Mart.) Solms-Laubach. Water-hyacinth. Naturalized floating aquatic perennial. Locally common in ponded area upstream from old Espada Dam and at various locations in Acequia de Espada. Voucher: Carr 21193. Photo: SAM-493, SAM-494, SAM-860, SAM-1027, SAM-1028. Line drawing: Diggs et al. (1999), p. 1341.

**Eichhornia azurea* (Swartz) Kunth. Peacock water-hyacinth. Introduced floating aquatic perennial. Reported by Van Auken (1981) from Mission Espada. This species is not reported for Texas in Jones, Wipff & Montgomery (1997), even as a cultivated plant.

**Pontederia cordata* L. Pickerelweed. Native perennial. Reported by Van Auken (1981) from Mission Espada and Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1341.

Portulacaceae Portulaca Family

Portulaca oleracea L. Common purslane. Native annual. Occasional in lawns and unshaded disturbed areas. Voucher: Carr & Benesh 21060. Line drawing: Diggs et al. (1999), p. 909.

Portulaca pilosa L. [*Portulaca mundula* I. M. Johnston] Chisme, shaggy portulaca. Native perennial. Rare on lawn of Mission San Jose. Voucher: Carr 21184. Photo: SAM-952, SAM-1118. Line drawing: Diggs et al. (1999), p. 909.

Talinum aurantiacum Engelm. [*Talinum angustissimum* (Gray) Woot. & Standl.] Orange flameflower. Native perennial. Rare in openings in upland woodlands. Voucher: Carr 21130. Photo: SAM-934. Line drawing: Diggs et al. (1999), p. 909.

Talinum paniculatum (Jacq.) Gaertn. Flame-flower. Native perennial. Rare in area but locally occasional in older-growth thornscrub on upland at S end of Labores de Espada. Voucher: Carr & Gallyoun 20348. Photo: SAM-1014, SAM-1015.

Primulaceae Primrose Family

**Anagallis arvensis* L. Scarlet pimpernel. Naturalized annual. Rare in old fields. Reported by Van Auken (1981) from Espada / Acequia Park. Voucher: Carr 21129. Photo: SAM-777. Line drawing: Diggs et al. (1999), p. 915.

Samolus valerandi L. var. *parviflorus* (Raf.) Hultén [*Samolus parviflorus* Raf.] Littleflower brook-primrose. Native annual. Rare, local on stones on dripping face of Espada Aqueduct and in wet spots around open sewer pipes in woodland on E bank downstream. Voucher: Carr 20798. Photo: SAM-283, SAM-894. Line drawing: Diggs et al. (1999), p. 915.

Punicaceae Pomegranate Family

**Punica granatum* L. Pomegranate. Introduced shrub. Planted in landscapes at Mission Concepción, Mission Espada and Mission San José. Photo: SAM-147, SAM-871.

Ranunculaceae Crowfoot Family

Anemone berlandieri Pritz. [*Anemone heterophylla* Nutt.] Tenpetal anemone. Native perennial. Occasional during spring in old fields and on mission lawns. Photo: SAM-668, SAM-789. Line drawing: Diggs et al. (1999), p. 919.

**Clematis drummondii* T. & G. Old man's beard, barba de chivato. Native perennial herbaceous vine. Common to abundant in upland old fields and woodlands and on fencelines; occasional just about anywhere elsewhere. Voucher: Carr 19868. Photo: SAM-108, SAM-109, SAM-110, SAM-120, SAM-121, SAM-122, SAM-285. Line drawing: Diggs et al. (1999), p. 919.

**Clematis pitcheri* T. & G. Purple leatherflower. Native perennial herbaceous vine. Occasional to locally common in riparian woodlands. Voucher: Carr 20101. Photo: SAM-419, SAM-420, SAM-421. Line drawing: Diggs et al. (1999), p. 919.

Clematis terniflora DC. [*Clematis dioscoreifolia* H. Lev. & Vaniot]. Sweet-autumn clematis. Naturalized perennial herbaceous vine. Rare in area, noted only along edge of riparian woodland along Acequia de Espada ca. 50-75 ft. N of Mission / Ashley Rd. and along E bank of old channel of San Antonio River just N of San Juan Woodland Trail. Vouchers: Carr 21222, Carr 21285. Photo: SAM-1081. Line drawing: Diggs et al. (1999), p. 923.

Consolida ajacis (L.) Schur [*Consolida ambigua* (L.) Ball & Heywood; *Delphinium ajacis* L.] Annual larkspur. Planted in landscape at Mission San José. Line drawing: Diggs et al. (1999), p. 923.

Ranunculus muricatus L. Roughseed buttercup. Naturalized perennial. Occasional on streambanks and wet spots in riparian woodlands. Vouchers: Carr 20448; Carr 20552. Photo: SAM-577, SAM-606. Line drawing: Diggs et al. (1999), p. 927.

Ranunculus sceleratus L. Blister buttercup, cursed buttercup. Native annual. Rare in area, noted only among Colocasia on mudflats along impoundment behind old Espada Dam in Espada Park. Voucher: Carr 20791.

Rhamnaceae Buckthorn Family

**Colubrina texensis* (T. & G.) Gray var. *texensis*. Texas colubrina, hog plum. Native shrub. Occasional in upland woodlands. Voucher: Carr & Carré 20788. Photo: SAM-039, SAM-734, SAM-738. Line drawing: Diggs et al. (1999), p. 935.

**Condalia hookeri* M. C. Johnston var. *hookeri*. Brasil, bluewood condalia. Native tree or tall shrub. Occasional in upland woodlands. Voucher: Carr 19817. Photo: SAM-313, SAM-314, SAM-931. Line drawing: Diggs et al. (1999), p. 935.

**Ziziphus obtusifolius* (Hook. ex T. & G.) Gray. Lotebush. Native shrub. Occasional in upland woodlands. Voucher: Carr 21064. Photo: SAM-312. Line drawing: Diggs et al. (1999), p. 939.

**Ziziphus zizyphus* (L.) G. Karsten [*Ziziphus jujuba* Mill.] Jujube. Introduced shrub or small tree. Reported by Van Auken (1981) from Mission San José. Line drawing: Diggs et al. (1999), p. 939.

Rosaceae Rose Family

**Crataegus* sp. Hawthorn. Introduced tree or shrub. Reported by Van Auken (1981) from Mission Concepción.

**Eriobotrya* sp. Loquat. Introduced shrub. Planted on grounds of Mission Concepción, Mission San José and Mission San Juan. Photo: SAM-944.

**Prunus* sp. Peach. Introduced tree. Reported by Van Auken (1981) from Mission Espada.

**Pyrus* sp. Prairie crabapple. Introduced tree or shrub. Reported by Van Auken (1981) from Mission San José.

Rosa banksiae Ait f. Lady Banks' rose. Introduced shrub. One large sprawling shrub planted on N side of visitor center at Mission Concepción. Photo: SAM-926, SAM-927.

**Rosa* sp. Yellow rose. Introduced shrub. One shrub in garden in front of church at Mission San Juan, at GPS point: N29°19.949', W098°27.323' +/- 25.2 ft. Photo: SAM-258, SAM-259. Van Auken (1981) observed three *Rosa* species at Mission San José and Mission Espada.

**Rubus riograndis* Bailey [*Rubus trivialis* Michx.] Southern dewberry. Native woody shrub. Common in riparian woodlands; occasional in upland woodlands. Voucher: Carr 21065. Photo: SAM-532, SAM-701. Line drawing: Diggs et al. (1999), p. 957.

Rubiaceae Madder Family

Cephalanthus occidentalis L. var. *californicus* Benth. Common buttonbush. Native shrub. Occasional on banks of Acequia de Espada. Voucher: Carr 21069. Photo: SAM-880. Line drawing: Diggs et al. (1999), p. 963.

**Galium aparine* L. Clingon bedstraw, cleavers. Native annual. Occasional to locally abundant in upland and riparian woodlands. Voucher: Carr 20463. Photo: SAM-1146. Line drawing: Diggs et al. (1999), p. 963.

**Galium virgatum* Nutt. Wand bedstraw. Native annual. Frequent in old fields; reported by Van Auken (1981) from Mission San Juan. Voucher: Carr 20735. Photo: SAM-735. Line drawing: Diggs et al. (1999), p. 965.

**Hedyotis nigricans* (Lam.) Fosb. var. *nigricans* [incl. *Hedyotis nigricans* var. *filifolia* (Chapm.) Shinners]. Prairie bluets. Native perennial. Rare in decent grassland remnant at 9243 Villamain; reported by Van Auken (1981) from Mission San José. Voucher: Carr 20755. Photo: SAM-811. Line drawing: Diggs et al. (1999), p. 965.

Houstonia parviflora Holzinger ex Greenman [*Hedyotis greenmanii* Fosberg]. Greenman's bluet. Native annual. Rare in less disturbed part of old field at 9243 Villamain. Voucher: Carr 20469. Photo: SAM-667. Line drawing: Diggs et al. (1999), p. 969.

Rutaceae Citrus Family

**Citrus* sp. Citrus. Introduced shrub or small tree. Reported by Van Auken (1981) from Mission San José.

**Ptelea trifoliata* L. subsp. *trifoliata* var. *mollis* T. & G. Wafer ash. Native tree. Occasional to frequent in riparian and upland woodlands. Voucher: Carr 19898. Photo: SAM-128, SAM-315, SAM-751. Line drawing: Diggs et al. (1999), p. 977.

Thamnosma texanum (Gray) Torr. Texas desert-rue, Dutchman's breeches. Native perennial. Rare in upland woodland on N side of I-410 just W of San Antonio River. Voucher: Carr 20476. Photo: SAM-680. Line drawing: Diggs et al. (1999), p. 977.

Salicaceae Willow Family

**Populus deltoides* Bart. ex Marsh. subsp. *deltoides*. Eastern cottonwood. Native tree. Rare, local along acequias and old river channels. Voucher: Carr 20817. Photo: SAM-134, SAM-699. Line drawing: Diggs et al. (1999), p. 977.

**Salix nigra* Marsh. Black willow. Native tree. Occasional along acequias and old river channels. Voucher: Carr 20543. Photo: SAM-206, SAM-207, SAM-715. Line drawing: Diggs et al. (1999), p. 981.

Sapindaceae Soapberry Family

Cardiospermum halicacabum L. Balloonvine. Native annual vine. Rare, one plant noted along margin of upland woodland during wet fall of 2002. Probably present in bed of channel of San Antonio River somewhere in area. Voucher: Carr & Benesh 21354. Photo: SAM-1159. Line drawing: Diggs et al. (1999), p. 981.

**Sapindus saponaria* L. var. *drummondii* (Hook. & Arn.) L. Benson [*Sapindus drummondii* Hook. & Arn.]. Western soapberry. Native tree. Occasional in riparian woodlands; more common in early to mid-successional "upland" woodlands. Voucher: Carr 19892. Photo: SAM-286, SAM-287, SAM-288, SAM-291, SAM-292. Line drawing: Diggs et al. (1999), p. 985.

Ungnadia speciosa Endl. Mexican buckeye. Shrub native to general area but introduced here. Recently planted on grounds of Mission San José and in woodland on slope north of Mission Espada, as well as in wildscape behind Mission San Juan. Absent from the native local flora. Photo: SAM-874. Line drawing: Diggs et al. (1999), p. 985.

Sapotaceae Sapodilla Family

**Sideroxylon lanuginosum* Michx. [*Bumelia lanuginosa* (Michx.) Pers.] Coma, gum bumelia, woolly-bucket bumelia. Native shrub or small tree. Occasional in riparian and upland woodlands. According to Van Auken (1981), these plants are subsp. *oblongifolium* (Nutt.) Pennington [*Bumelia lanuginosa* var. *albicans* Sarg.]. Voucher: Carr 19857 (vegetative). Photo: SAM-018, SAM-019, SAM-316, SAM-317. Line drawing: Diggs et al. (1999), p. 985.

Scrophulariaceae Figwort Family

Agalinis strictifolia (Benth.) Penn. [*Gerardia strictifolia* Benth.] Longstalk gerardia. Native perennial. Occasional in old fields and along margin of upland woodlands. Voucher: Carr 19842. Photo: SAM-361, Photo: SAM-442, SAM-443, SAM-456.

Castilleja indivisa Engelm. Annual paintbrush. Native annual. Rare in area, noted only in opening in upland woodland on N side of I-410 just W of San Antonio River. Voucher: Carr & Carré 20780. Photo: SAM-623, SAM-624. Line drawing: Diggs et al. (1999), p. 997.

**Leucophyllum frutescens* (Berl.) I. M. Johnst. Cenizo. Native shrub. Planted in landscapes around missions, e.g. Mission Concepción and Mission San José; no naturally-occurring (wild) plants observed. Photo: SAM-027.

Maurandya antirrhiniflora Willd. Snapdragonvine. Native perennial herbaceous vine. Rare in upland woodlands. Voucher: Carr 20793. Photo: SAM-444, SAM-749. Line drawing: Diggs et al. (1999), p. 1005.

**Veronica agrestis* L. [*Veronica polita* Fries]. Wayside speedwell. Naturalized annual. Rare in lawn at Mission Espada; reported by Van Auken (1981) from Mission Concepción. Voucher: Carr 20449. Line drawing: Diggs et al. (1999), p. 1011.

Veronica anagallis-aquatica L. Water speedwell. Naturalized perennial. Rare on creekbanks in riparian woodlands. Voucher: Carr 20545. Photo: SAM-611, SAM-612. Line drawing: Diggs et al. (1999), p. 1013.

Veronica arvensis L. Common speedwell. Naturalized annual. Occasional during spring on lawn at Mission San Juan. Voucher: Carr 20548. Line drawing: Diggs et al. (1999), p. 1013.

Veronica peregrina L. Wandering veronica. Native annual. Occasional on shaded banks of old river channel; rare on mission lawns. Voucher: Carr 20542. Photo: SAM-696. Line drawing: Diggs et al. (1999), p. 1013.

Veronica persica Poir. Persian speedwell. Naturalized annual. Rare on bank of old channel of San Antonio River just below old Old Espada Dam. Voucher: Carr 20460. Photo: SAM-609, SAM-610. Line drawing: Diggs et al. (1999), p. 1013.

Simaroubaceae Quassia Family

**Ailanthus altissima* (Mill.) Swingle. Ghetto palm, tree-of-heaven. Naturalized tree. Rare in upland woodland along E side of Acequia de Espada N of Ashley/Mission Rd. and in riparian/upland woodland behind drive-in theater NE of Mission San Juan; reported by Van Auken (1981) from Mission San José and Espada / Acequia Park. Voucher: Carr 21150. Photo: SAM-954, SAM-955. Line drawing: Diggs et al. (1999), p. 1019. On 22 July 2002, the population near Acequia de Espada consisted of about 20 trunks in a 25-foot circle at N29°20.253', W098°27.573'; the largest was 20-25 ft. tall and 4-5 in. dbh.

Smilacaceae Greenbriar Family

**Smilax bona-nox* L. Saw greenbriar. Native woody vine. Occasional in riparian and upland woodlands. Voucher: Carr 20752. Photo: SAM-809. Line drawing: Diggs et al. (1999), p. 1347.

**Smilax rotundifolia* L. Common greenbriar. Native woody vine. Reported by Van Auken (1981) from Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1347. This is a species of East Texas that is probably absent from the Missions area.

Solanaceae Nightshade Family

**Capsicum annuum* L. var. *aviculare* (Dierb.) D'Arcy & Eschbaugh [*Capsicum annuum* L. var. *glabriusculum* (Dun.) Heiser & Pickersgill]. Chilipiquín, bird pepper. Native shrub. Occasional in upland woodlands; planted(?) at Mission San José. Vouchers: Carr 20094; Carr 21151. Photo: SAM-1049, SAM-1050, SAM-1093. Line drawing: Diggs et al. (1999), p. 1019.

Chamaesaracha coronopus (Dun.) Gray. False ground-cherry. Native annual. Rare, noted only in compacted silt in driveway at Mission Espada, at N29°19.024', W098°26.988' +/- 13.7 ft. Voucher: Carr & Benesh 19813. Photo: SAM-1107. Line drawing: Diggs et al. (1999), p. 1021.

Lycium berlandieri Dun. Berlandier wolf-berry. Native shrub. Occasional in upland woodlands. Voucher: Carr & Gallyoun 20350. Photo: SAM-517, SAM-935, SAM-1160.

**Nicotiana repanda* Willd. ex Lehm. Fiddleleaf tobacco. Native annual. Apparently rare, noted on chunk of honeycombed limestone in quarry pit at Mission Concepcion; on lawn at NE corner of compound at Mission Espada; and in upland woodland on Labores de Espada. Reported by Van Auken (1981) from three mission tracts. Voucher: Carr 20800. Photo: SAM-832. Line drawing: Diggs et al. (1999), p. 1025.

**Physalis cinarascens* (Dun.) Hitch. var. *cinarescens* [*Physalis viscosa* L. var. *cinarescens* (Dun.) Waterfall]. Clammy ground-cherry. Native annual. Occasional in upland woodlands and old fields. Vouchers: Carr 19830, Carr 20055. Photo: SAM-378, SAM-379. Line drawing: Diggs et al. (1999), p. 1025.

Solanum dimidiatum Raf. Western horse-nettle. Native perennial. Apparently rare in area, a few plants on bermudagrass lawn along margin of riparian woodland along Acequia de San Juan on San Juan Dam Tract; these plants were repeatedly mown during 2002, and thus both the voucher and photo are of vegetative material. Voucher: Carr 21219. Photo: SAM-995. Line drawing: Diggs et al. (1999), p. 1033.

**Solanum elaeagnifolium* Cav. Silverleaf nightshade. Native perennial. Common to locally abundant in old fields, athletic fields and other open sites; less common in upland woodlands. Voucher: Carr 19859. Photos: SAM-227, SAM-228, SAM-333. Line drawing: Diggs et al. (1999), p. 1033.

Solanum ptychanthum Dun. [*Solanum americanum* of authors, not Mill; *Solanum nigrum* of authors, not L.] American nightshade, hierba mora negra. Native annual. Voucher: Carr 21196. Photo: SAM-1032. Line drawing: Diggs et al. (1999), p. 1033.

Solanum rostratum Dun. Buffalo-bur. Native annual. Apparently rare in old fields. Vouchers: Carr 19821; Carr 21163. Photo: SAM-979. Line drawing: Diggs et al. (1999), p. 1033.

**Solanum triquetrum* Cav. Texas nightshade. Native shrub. Occasional in riparian woodlands an in fencelines at some mission sites. Voucher: Carr & Benesh 21355. Photo: SAM-438, SAM-439. Line drawing: Diggs et al. (1999), p. 1033.

Sterculiaceae Cacao Family

Hermannia texana Gray. Mexican mallow. Native perennial. Rare in area, noted only in occasionally mown bed of access road under power lines on N side of I-410 just W of San Antonio River floodplain; this site is probably immediately adjacent to rather than on NPS property. Voucher: Carr 21358. Photo: SAM-946.

Melochia pyramidata L. Anglepod melochia. Native perennial. Occasional in mown lawns and old fields. Voucher: Carr 19824. Photos: SAM-185, SAM-332. Line drawing: Diggs et al. (1999), p. 1037.

Tamaricaceae Salt-cedar Family

**Tamarix* sp. Salt-cedar. Introduced shrub. Planted along San José Drive at Mission San José. Also reported by Van Auken (1981) from Espada / Acequia Park. Photos: SAM-409, SAM-410. Line drawing: Diggs et al. (1999), p. 1037.

Tiliaceae Basswood Family

Corchorus hirtus L. Orinoco jute. Native perennial (or annual in this area?). Present in a wide variety of early- to mid-successional habitats yet rare in all of them. Voucher: Carr 21227. Photo: SAM-1090, SAM-1152.

Typhaceae Cat-tail Family

Typha domingensis Pers. Narrowleaf cat-tail. Native perennial. One large colony in impoundment upstream from Espada Dam in Espada Park. Voucher: Carr & Benesh 21058. Photo: SAM-203, SAM-204. Line drawing: Diggs et al. (1999), p. 1351.

Ulmaceae Elm Family

**Celtis laevigata* Willd. var. *laevigata*. Sugar hackberry. Native tree. Common in riparian and upland woodlands, locally dominant during some successional stages. Many or most individuals in the area cannot be distinguished at a glance from members of the next taxon. Vouchers: Carr 19897; Carr 20547; Carr 20753. Photo: SAM-284, SAM-384, SAM-385. Line drawing: Diggs et al. (1999), p. 1037.

Celtis laevigata Willd. var. *reticulata* (Torr.) Benson [*Celtis reticulata* Torr]. Netleaf hackberry. Occasional in upland woodlands. Voucher: Carr 19896. Photo: SAM-936. Line drawing: Diggs et al. (1999), p. 1037.

**Celtis lindheimeri* Engelm. Lindheimer hackberry. Native tree. Reported by Van Auken (1981) from Mission Espada and Espada / Acequia Park.

**Celtis pallida* Torr. Granjeno, spiny hackberry. Native tree or large shrub. Frequent in upland woodlands; occasional in riparian woodlands. Voucher: Carr 20777. Photo: SAM-306, SAM-885.

Ulmus americana L. American elm. Native tree. Rare in riparian woodlands; one large old tree among pecans at N end of picnic area in Espada Park. Voucher: Carr 21098. Photo: SAM-892. Line drawing: Diggs et al. (1999), p. 1041.

**Ulmus crassifolia* Nutt. Cedar elm. Native tree. Occasional in riparian and upland woodlands; also newly planted in landscapes around several missions. Voucher: Carr 21063. Photos: SAM-338, SAM-339, SAM-441. Line drawing: Diggs et al. (1999), p. 1041.

**Ulmus rubra* Muhl. Slippery elm. Native tree. Reported by Van Auken (1981) from Mission San José. One recently-planted smallish tree in garden in front of visitor center at Mission San José maybe this species. Photo: SAM-271, SAM-272. Line drawing: Diggs et al. (1999), p. 1041.

Urticaceae Nettle Family

Boehmeria cylindrica (L.) Sw. False nettle. Native perennial. Locally frequent in moist soils at several locations along Acequia de Espada. Voucher: Carr 20100. Photo: SAM-422, SAM-423. Line drawing: Diggs et al. (1999), p. 1045.

Parietaria pensylvanica Muhl. ex Willd. Cucumberweed, rock pellitory. Occasional during spring in riparian woodlands and other shaded sites. Voucher: Carr 20811. Photo: SAM-601, SAM-602, SAM-712. Line drawing: Diggs et al. (1999), p. 1045.

Pilea microphylla (L.) Liebm. Artillery-plant. Naturalized annual. Rare in area, noted only on mortar and stone of walls of Mission Concepción and on low wall at Mission San José. Vouchers: Carr 19762, Carr & Benesh 19809. Photo: SAM-231, SAM-232, SAM-233.

Valerianaceae Valerian Family

Valerianella radiata (L.) Dufr. Common corn-salad. Native annual. Rare in early spring along margins of riparian woodlands. Photo: SAM-683. Line drawing: Diggs et al. (1999), p. 1047.

Verbenaceae Vervain Family

**Aloysia gratissima* (Gill. & Hook.) Troncoso. Whitebrush. Native shrub. Occasional in upland woodlands. Voucher: Carr 20792. Photo: SAM-792. Line drawing: Diggs et al. (1999), p. 1051.

Callicarpa americana L. American beautyberry. Shrub, native to Texas but introduced in area. Planted in new landscape around molino at Mission San Jose. No wild plants observed. Photo: SAM-1096. Line drawing: Diggs et al. (1999), p. 1051.

**Glandularia bipinnatifida* (Nutt.) Nutt. [*Verbena bipinnatifida* Nutt.] Dakota vervain. Native perennial. Occasional in old fields, mission lawns and other disturbed unshaded sites. Voucher: Carr 20749. Photo: SAM-807. Line drawing: Diggs et al. (1999), p. 1051.

Glandularia pumila (Rydb.) Umber [*Verbena pumila* Rydb.]. Pink vervain, low vervain. Native annual. Occasional on lawns at Mission Concepción, Mission San Juan and Mission Espada. Voucher: Carr 20460. Photo: SAM-573. Line drawing: Diggs et al. (1999), p. 1051.

Glandularia quadrangulata (Heller) Umber. White vervain. Native annual. Occasional on mission lawns. Voucher: Carr 20469. Photo: SAM-586, SAM-627, SAM-628.

Lantana camara f. *hybrida* "New Gold". Yellow lantana. Introduced cultivar shrub. Planted in gardens at Mission Concepción and Mission San José. Photos: SAM-355, SAM-356. Line drawing: Diggs et al. (1999), p. 1057.

Lantana montividensis (Spreng.) Briq. Purple lantana, weeping lantana. Introduced shrub. Planted in landscapes around Mission Concepción and Mission San José. Photo: SAM-269, SAM-270.

**Lantana urticoides* von Hayek [*Lantana horrida* of Texas authors, not Kunth]. Texas lantana. Native shrub. Rare in old fields and upland woodlands; reported by Van Auken (1981) from four mission tracts. Voucher: Carr 21071. Photos: SAM-347, SAM-348, SAM-450. Line drawing: Diggs et al. (1999), p. 1057.

**Phyla nodiflora* (L.) Greene [*Lippia nodiflora* (L.) Michx.; incl. *Phyla incisa* Small]. Fogfruit or frogfruit. Native perennial. Occasional in a broad spectrum of open habitats. Voucher: Carr 20902. Photo: SAM-852. Line drawing: Diggs et al. (1999), p. 1057.

Verbena brasiliensis Vell. Brazilian vervain. Naturalized perennial. Occasional along waterways. Voucher: Carr & Benesh 21057. Photo: SAM-901. Line drawing: Diggs et al. (1999), p. 1059.

Verbena canescens Kunth. Gray vervain. Native perennial. Occasional in old fields and on mission lawns. Voucher: Carr 20760. Photo: SAM-932. Line drawing: Diggs et al. (1999), p. 1059.

Verbena halei Small [*Verbena officinalis* L. subsp. *halei* (Small) Barber]. Texas vervain. Native perennial. Occasional in upland woodlands and old fields. Voucher: Carr 19863. Photo: SAM-786. Line drawing: Diggs et al. (1999), p. 1059.

**Verbena litoralis* Kunth. Seashore vervain. Introduced perennial. Reported by Van Auken (1981) from all mission tracts.

**Verbena neomexicana* (Gray) Small var. *hirtella* Perry. New Mexico vervain. Native perennial. Reported by Van Auken (1981) from three mission tracts. Line drawing: Diggs et al. (1999), p. 1059.

Verbena x hybrida Voss [*Verbena x hortensis* Hort.] Red vervain, garden vervain. Annual or perennial cultivar. Planted in garden in front of visitor center at Mission Concepción. Photo: SAM-244.

**Vitex agnus-castus* L. Chaste-bush. Naturalized shrub. Planted in landscape around Mission Concepción; escaped along Acequia de San Juan on San Juan Dam tract. Voucher: Carr 20904. Photos: SAM-228, SAM-851. Line drawing: Diggs et al. (1999), p. 1063.

Violaceae Violet Family

Hybanthus verticillatus (Ort.) Baill. var. *verticillata*. Whorled green-violet. Native perennial. Rare in old field on San Juan Dam Tract and in athletic fields W of Mission Concepción. Vouchers: Carr 19768; Carr 29723. Photo: SAM-770, SAM-799. Line drawing: Diggs et al. (1999), p. 1063.

**Viola sororia* Willd var. *missouriensis* (Greene) McKinney [*Viola missouriensis* Greene]. Missouri violet. Reported by Van Auken (1981) from Mission Espada and Espada / Acequia Park. Line drawing: Diggs et al. (1999), p. 1063.

Viscaceae Mistletoe Family

**Phoradendron tomentosum* (DC.) Gray subsp. *tomentosum*. Mistletoe. Native woody parasite. Occasional, usually on mesquite in upland woodlands and in mission landscapes. Voucher: Carr 21158. Photo: SAM-249, SAM-1133. Line drawing: Diggs et al. (1999), p. 1067.

Vitaceae Grape Family

**Ampelopsis arborea* (L.) Koehne. Peppervine. Native woody vine. Occasional to locally abundant in riparian woodlands. Voucher: Carr & Benesh 21059. Photo: SAM-134, SAM-135, SAM-191, SAM-192. Line drawing: Diggs et al. (1999), p. 1076.

**Cissus incisa* (Nutt.) Des Moul. Ivy tree-bine, cow-itch. Native woody vine. Occasional in riparian and upland woodlands. Voucher: Carr 21062. Photo: SAM-295, SAM-296, SAM-774, SAM-833, SAM-1019, SAM-1144. Line drawing: Diggs et al. (1999), p. 1067.

**Parthenocissus quinquefolia* (L.) Planch. Virginia creeper. Native woody vine. Rather common in riparian woodlands; scattered elsewhere. Voucher: Carr 20906. Photo: SAM-846. Line drawing: Diggs et al. (1999), p. 1071.

**Vitis cinerea* Engelm. ex Millardet var. *helleri* (Bailey) M. O. Moore [*Vitis berlandieri* Planch.]. Sweet grape, winter grape. Native woody vine. Occasional in riparian and upland woodlands. Vouchers: Carr 19802, Carr 20823. Photo: SAM-012, SAM-013. Line drawing: Diggs et al. (1999), p. 1073.

**Vitis mustangensis* Buckl. Mustang grape. Native woody vine. Common in riparian and upland woodlands. Voucher: Carr 20814. Photo: SAM-881. Line drawing: Diggs et al. (1999), p. 1073.

Zygophyllaceae Caltrop Family

Kallstroemia parviflora Nort. Warty caltrop. Native annual. Locally common in compacted barren areas on lawns around missions. Voucher: Carr 19781. Photo: SAM-989. Line drawing: Diggs et al. (1999), p. 1075.

**Tribulus terrestris* L. Puncture-vine, abrojo de flor amarilla. Naturalized annual. Locally common in compacted barren areas on lawns around missions; also in old fields and other open disturbed areas. Voucher: Carr 19865. Photo: SAM-099, SAM-100. Line drawing: Diggs et al. (1999), p. 1075.

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b) *Fauna*

REPTILES AND AMPHIBIANS FOUND AT SAAN

Common Name	***Scientific Name***
Blanchard's Cricket Frog	*Acris crepitans blanchardi*
Gulf Coast Toad	*Bufo valliceps*
Great Plains Narrowmouth Toad	*Gastrophryne olivacea*
Cliff Chirping Frog	*Syrrhophus marnockii*
Guadalupe Spiny Softshell	*Apalone spinifera guadalupensis*
Common Snapping Turtle	*Chelydra serpentina*
Texas Tortoise	*Gopherus berlandieri*
Texas River Cooter	*Pseudemys texana*
Red-eared Slider	*Trachemys scripta elegans*
Green Anole	*Anolis carolinensis*
Texas Spotted Whiptail	*Aspidoscelis gularis*
Texas Spiny Lizard	*Sceloporus olivaceus*
Cottonmouth	*Agkistrodon piscivorus*
West. Diamondback Rattlesnake	*Crotalus atrox*
Great Plains Rat Snake	*Elaphe guttata emoryi*
Texas Rat Snake	*Elaphe obsolete lindheimeri*
Desert King Snake	*Lampropeltis getula splendida*
Plains Blind Snake	*Leptotyphlops dulcis dulcis*
Western Coachwhip	*Masticophis flagellum testaceus*
Schott's Whipsnake	*Masticophis schotti*
Eastern Coral Snake	*Micrurus fulvius tener*
Blotched Water Snake	*Nerodia erythrogaster*
Diamondback Water Snake	*Nerodia rhombifer*
Rough Green Snake	*Opheodrys aestivus*
Texas Long-nosed Snake	*Rhinocheilus lecontei tessellatus*
Texas Patch-nosed Snake	*Salvadora grahamiae lineata*
Texas Brown Snake	*Storeria dekayi texana*
Checkered Garter Snake	*Thamnophis marcianus*
Rough Earth Snake	*Virginia striatula*
29 Species	

MAMMALS FOUND AT SAAN

Common Name	***Scientific Name***
Fox Squirrel	*Sciurus niger*

Ground Squirrel	*Spermophilus spp.*
Pocket Gopher	*Geomys attwateri*
Hispid Pocket Mouse	*Chaetodipus hispidus*
Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
White-footed Mouse	*Peromyscus leucopus*
Deer Mouse	*Peromyscus maniculatus*
Pygmy Mouse	*Baiomys taylori*
Hispid Cotton Rat	*Sigmodon hispidus*
Roof Rat	*Rattus rattus*
House Mouse	*Mus musculus*
Least Shrew	*Cryptotis parva*
Virginia Opossum	*Didelphis virginiana*
Nine-banded Armadillo	*Dasypus novemcinctus*
Eastern Cottontail	*Sylvilagus floridanus*
Black-tailed Jackrabbit	*Lepus californicus*
Nutria	*Myocaster coypus*
Coyote	*Canis latrans*
Gray Fox	*Urocyon cinereoargenteus*
Raccoon	*Procyon lotor*
Striped Skunk	*Mephitis mephitis*
Bobcat	*Lynx rufus*
Feral Cat	*Felis catus*
White-tailed Deer	*Odocoileus virginianus*
Feral Pig	*Sus scrofa*
Collared Peccary	*Tayassu tajacu*
Northern Yellow Bat	*Lasiurus intermedius*
Eastern Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
Evening Bat	*Nycticeius humeralis*
Mexican Free-tailed Bat	*Tadarida brasiliensis*
27 Species	

SAN ANTONIO MISSIONS NHP BIRDLIST

ORDER ANSERIFORMES
Black-bellied Whistling Duck (*Dendrocygna autumnalis*)
Canada Goose (*Branta canadensis*)
Greater White-fronted Goose (*Anser albifrons)*
Tundra Swan (*Cygnus columbianus*)
Wood duck (*Aix sponsa*)
Gadwall (*Anas strepera)*
Mallard (*Anas platyrhynchos*)
Blue-winged Teal (*Anas discors*)
Northern Shoveler (*Anas clypeata*)
Ruddy Duck (*Oxyura jamaicensis*)

ORDER GALLIFORMES
Wild Turkey (*Meleagris gallopavo*)
Northern Bobwhite (*Colinus virginianus*)

ORDER PODICIPEDIFORMES
Least Grebe (*Tachybaptus dominicus)*
Pied-billed Grebe (*Podilymbus podiceps*)
Eared Grebe (*Podiceps nigricollis*)

ORDER PELECANIFORMES
Double-crested Cormorant (*Phalacrocorax auritus*)

ORDER CICONIIFORMES
Great Blue Heron (*Ardea herodias*)
Great Egret (*Ardea alba*)
Snowy Egret (*Egretta thula*)
Little Blue Heron (*Egretta caerulea*)
Cattle Egret (*Bubulcus ibis*)
Green Heron (*Butorides virescens*)
Yellow-crowned Night-Heron (*Nyctanassa violacea*)
Black Vulture (*Coragyps atratus*)
Turkey Vulture (*Cathartes aura*)

ORDER FALCONIFORMES
Osprey (*Pandion haliaetus*)
Sharp-shinned Hawk (*Accipiter striatus*)
Cooper's Hawk (*Accipiter cooperii*)
Red-shouldered Hawk (*Buteo lineatus*)
Broad-winged Hawk (*Buteo platypterus*)
Swainson's Hawk (*Buteo swainsoni*)
Red-tailed Hawk (*Buteo jamaicensis*)
Crested Caracara (*Caracara cheriway*)
American Kestrel (*Falco sparverius*)
Merlin (*Falco columbarius)*
Peregrine Falcon (*Falco peregrinus*)

ORDER GRUIFORMES
Sandhill Crane (*Grus Canadensis)*

ORDER CHARADRIIFORMES
Killdeer (*Charadrius vociferous*)
Greater Yellowlegs (*Tringa melanoleuca*)
Lesser Yellowlegs (*Tringa flavipes)*
Black-necked Stilt (*Himantopus mexicanus)*
Least Sandpiper *(Calidris minutilla)*
Spotted Sandpiper (*Actitus macularia*)
Western Sandpiper (*Calidris mauri*)
Pectoral Sandpiper (*Calidris melanotos*)
Long-billed Dowitcher (*Limnodromus scolopaceus*)
Wilson’s Snipe (*Gallinago delicate)*
American Woodcock (*Scolopax minor*)

Wilson's Phalarope (*Phalaropus tricolor)*
Bonaparte's Gull (*Larus Philadelphia)*
Franklin's Gull (*Larus pipixcan*)
Ring-billed Gull (*Larus delawarensis*)
Herring Gull (*Larus argentatus*)

ORDER COLUMBIFORMES
White-winged Dove (*Zenaida asiatica*)
Mourning Dove (*Zenaida macroura*)
Inca Dove (*Columbina inca*)
Rock Pigeon (*Columba livia)* (I)

ORDER CUCULIFORMES
Yellow-billed Cuckoo (*Coccyzus americanus*)
Greater Roadrunner (*Geococcyx californianus*)

ORDER STRIGIFORMES
Great Horned Owl (*Bubo virginianus*)
Barred Owl (*Strix varia*)
Barn Owl (*Tyto alba)*

ORDER CAPRIMULGIFORMES
Common Nighthawk (*Chordeiles minor*)
Common Poorwill (*Phalaenoptilus nuttallii)*

ORDER APODIFORMES
Chimney Swift (*Chaetura pelagica*)
Ruby-throated Hummingbird (*Archilochus colubris*)
Black-chinned Hummingbird (*Archilochus alexandri*)
Rufous Hummingbird (*Selasphorus rufus*)

ORDER CORACIIFORMES: KINGFISHERS
Belted Kingfisher (*Ceryle alcyon*)
Green Kingfisher (*Chloroceryle Americana*)

ORDER PICIFORMESES
Golden-fronted Woodpecker (*Melanerpes aurifrons*)
Red-bellied Woodpecker (*Melanerpes carolinus*)
Yellow-bellied Sapsucker (*Sphyrapicus varius*)
Ladder-backed Woodpecker (*Picoides scalaris*)
Downy Woodpecker (*Picoides pubescens*)
Northern Flicker (*Colaptes auratus*)

ORDER PASSERIFORMES

FAMILY TYRANNIDAE
Olive-sided Flycatcher (*Contopus cooperi)*
Eastern Wood-Pewee (*Contopus virens*)
Eastern Phoebe (*Sayornis phoebe*)
Say's Phoebe (*Sayornis saya)*
Willow Flycatcher (*Empidonax traillii)*

Least Flycatcher (*Empidonax minimus)*
Great Crested Flycatcher (*Myiarchus crinitus*)
Western Kingbird (*Tyrannus verticalis*)
Eastern Kingbird (*Tyrannus tyrannus*)
Scissor-tailed Flycatcher (*Tyrannus forficatus*)
Vermilion Flycatcher (*Pyrocephalus rubinus)*

FAMILY LANIIDAE
Loggerhead Shrike (*Lanius ludovicianus*)

FAMILY VIREONIDAE
White-eyed Vireo (*Vireo griseus*)
Bell's Vireo (*Vireo bellii*)
Yellow-throated Vireo (*Vireo flavifrons*)
Blue-headed Vireo (*Vireo solitarius*)
Philadelphia Vireo (*Vireo philadelphicus)*
Red-eyed Vireo (*Vireo olivaceus*)

FAMILY CORVIDAE
American Crow (*Corvus brachyrhynchos*)
Blue Jay (*Cyanocitta cristata)*

FAMILY HIRUNDINIDAE
Purple Martin (*Progne subis*)
Northern Rough-winged Swallow (*Stelgidopteryx serripennis*)
Barn Swallow (*Hirundo rustica*)
Cliff Swallow (*Petrochelidon pyrrhonata)*

FAMILY PARIDAE
Carolina Chickadee (*Poecile carolinensis*)
Black-crested Titmouse (*Baeolophus atricristatus*)

FAMILY CERTHIIDAE
Brown Creeper (*Certhia Americana*)

FAMILY TROGLODYTIDAE
Cactus Wren (*Campylorhynchus brunneicapillus*)
Canyon Wren (*Catherpes mexicanus*)
Carolina Wren (*Thryothorus ludovicianus*)
Bewick's Wren (*Thryomanes bewickii*)
House Wren (*Troglodytes aedon*)
Winter Wren (*Troglodytes troglodytes)*

FAMILY REGULIDAE
Ruby-crowned Kinglet (*Regulus calendula*)
Golden-crowned Kinglet (*Regulus satrapa*)

FAMILY SYLVIIDAE
Blue-gray Gnatcatcher (*Polioptila caerulea*)

FAMILY TURDIDAE

Eastern Bluebird (*Sialia sialis*)
Swainson's Thrush (*Catharus ustulatus*)
Hermit Thrush (*Catharus guttatus*)
American Robin (*Turdus migratorius*)

FAMILY MIMIDAE
Gray Catbird (*Dumetella carolinensis*)
Northern Mockingbird (*Mimus polyglottos*)
Brown Thrasher (*Toxostoma rufum*)
Curve-billed Thrasher (*Toxostoma curvirostre*)

FAMILY STURNIDAE
European Starling (*Sturnus vulgaris*) (I)

FAMILY MOTACILLIDAE
American Pipit (*Anthus rubescens)*

FAMILY BOMBYCILLIDAE
Cedar Waxwing (*Bombycilla cedrorum*)

FAMILY PARULIDAE
Tennessee Warbler (*Vermivora peregrine*)
Orange-crowned Warbler (*Vermivora celata*)
Nashville Warbler (*Vermivora ruficapilla*)
Yellow Warbler (*Dendroica petechia*)
Chestnut-sided Warbler (*Dendroica pensylvanica)*
Magnolia Warbler (*Dendroica magnolia)*
Black-throated Blue Warbler (*Dendroica caerulescens*)
Black-throated Green Warbler (*Dendroica virens)*
Blackburnian Warbler (*Dendroica fusca)*
Cerulean Warbler (*Dendroica cerulean)*
Yellow-rumped Warbler (*Dendroica coronata*)
Black-and-white Warbler (*Mniotilta varia*)
American Redstart (*Setophaga ruticilla)*
Northern Waterthrush (*Seiurus noveboracensis)*
Louisiana Waterthrush (*Seiurus motacilla*)
Mourning Warbler (*Oporornis Philadelphia*)
Wilson's Warbler (*Wilsonia pusilla)*
Hooded Warbler (*Wilsonia citrine)*
Common Yellowthroat (*Geothlypis trichas*)
Yellow-breasted Chat (*Icteria virens)*

FAMILY THRAUPIDAE
Summer Tanager (*Piranga rubra*)
Scarlet Tanager (*Piranga olivacea)*
Western Tanager (*Piranga ludoviciana*)

FAMILY EMBERIZIDAE
Spotted Towhee (*Pipilo maculates*)
Chipping Sparrow (*Spizella passerine*)
Clay-colored Sparrow (*Spizella pallida)*

Field Sparrow (*Spizella pusilla*)
Vesper Sparrow (*Pooecetes gramineus*)
Lark Sparrow (*Chondestes grammacus*)
Song Sparrow (*Melospiza melodia*)
Lincoln's Sparrow (*Melospiza lincolnii*)
White-throated Sparrow (*Zonotrichia albicollis*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
Dark-eyed Junco (*Junco hyemalis*)

FAMILY CARDINALIDAE
Northern Cardinal (*Cardinalis cardinalis*)
Pyrrhuloxia (*Cardinalis sinuatus*)
Rose-breasted Grosbeak (*Pheucticus ludovicianus)*
Blue Grosbeak (*Passerina caerulea)*
Indigo Bunting (*Passerina cyanea*)
Painted Bunting (*Passerina ciris*)

FAMILY ICTERIDAE
Red-winged Blackbird (*Agelaius phoeniceus*)
Eastern Meadowlark (*Sturnella magna*)
Western Meadowlark (*Sturnella neglecta)*
Common Grackle (*Quiscalus quiscula*)
Great-tailed Grackle (*Quiscalus mexicanus*)
Brown-headed Cowbird (*Molothrus ater*)
Orchard Oriole (*Icterus spurious*)
Baltimore Oriole (*Icterus galbula*)

FAMILY FRINGILLIDAE
House Finch (*Carpodacus mexicanus*)
Lesser Goldfinch (*Carduelis psaltria*)
American Goldfinch (*Carduelis tristis*)

FAMILY PASSERIDAE
House Sparrow (*Passer domesticus*) (I)

(I) = introduced

174 species total (6/22/04)

c) Threatened and Endangered Species

Federal and State Listed Species that have been documented in or are possible inhabitants of SAAN (* Wilson and/or Bexar Counties; ^ Wilson County; no mark Bexar County). List of species was adapted from the SAAN Resource Management Plan 2001 using current park research.

Species	Scientific name	Status
Plants		
Correll's False Dragon-head	*Physostegia correllii*	Federal Species of Concern
Mammals		
Ocelot ^	*Felis pardalis*	Federally Endangered
Plains Spotted Skunk *	*Spilogale putorius interrupta*	Rare (Texas state status)
Reptiles		
Texas Horned Lizard *	*Phrynosoma cornutum*	Federal Species of Concern
Texas Tortoise*	*Gopherus berlandieri*	Texas State Threatened
Indigo Snake	*Drymarchon corais*	Texas State Threatened
Amphibians		
No documented species		
Birds		
Bald Eagle	*Haliaeetus leucocephalus*	Federally Threatened
Ferruginous Hawk	*Buteo regalis*	Federal Species of Concern
Loggerhead Shrike	*Lanius ludovicianus*	Federal Species of Concern
White-faced Ibis	*Plegadis chihi*	Federal Species of Concern; Texas State Threatened
American Peregrine Falcon *	*Falco peregrinus anatum*	Texas State Endangered
Arctic Peregrine Falcon *	*Falco peregrinus tundrius*	Texas State Threatened
Wood Stork *	*Mycteria americana*	Texas State Threatened
Zone-tailed Hawk	*Buteo albonotatus*	Texas State Threatened
Fish		
Guadalupe Bass	*Micropterus treculli*	Rare (Texas state status)
Invertebrates		
Maculated Manfreda Skipper *	*Stallingsia maculosus*	Federal Species of Concern

2) Rancho Unit

a) Flora

Annotated List of the Vascular Plants
of Rancho de Las Cabras National Historic Site,
Wilson County, Texas
October 2002 Draft

William R. Carr
The Nature Conservancy of Texas

This list is based on observations during surveys conducted on 30 May, 25 July, 14 and 23 August, 17 and 21 September, 30-31 October 2001 and 25-26 March, 22-23 April, 17 and 20 May, 13 and 18 June, 11 and 24 July, 12-13 August, 23 and 26 September, and 23 and 29 October 2002. It will be expanded and otherwise modified following future surveys. Scientific names follow Jones, Wipff & Montgomery (1997); pertinent synonyms, particularly those used in Correll & Johnston (1970), are provided in brackets. Common names follow Diggs, Lipscomb & O'Kennon (1999), Hatch, Gandhi & Brown (1990) and various other sources.

FERNS AND FERN ALLIES

Equisetaceae Horsetail Family

Equisetum laevigatum A. Braun. Horsetail. Native perennial. Absent from most of riparian woodland but locally common on sandy bank of San Antonio River in NE corner of property. Voucher: Carr, Benesh & Gallyoun 21085. Photo: SAM-205. Line drawing: Diggs et al. (1999), p. 177.

Marsileaceae Water-clover Family

Marsilea macropoda Engelm. ex A. Br. Water-clover. Native perennial. Occasional colonies in clay in bed and on banks of Picosa Creek ca. 0.2-0.3 mi N of its mouth at San Antonio River; conspicuous only after rains. Voucher: Carr 19904. Photo: SAM-435. Line drawing: Diggs et al. (1999), p. 187.

Pteridaceae Maidenhair Fern Family

Cheilanthes alabamensis (Buckl.) Kunze. Alabama lipfern. Native perennial. Rare on crumbly siltstone and sandstone exposures in gully heads. Voucher: Carr & Westlund 20649. Photo: SAM-748. Line drawing: Diggs et al. (1999), p. 197.

Pellaea atropurpurea (L.) Link. Purple cliffbrake. Native perennial. Rare on crumbly siltstone exposures in canyon heads. Voucher: Carr & Westlund 20648. Photo: SAM-750. Line drawing: Diggs et al. (1999), p. 199.

FLOWERING PLANTS

Acanthaceae Acanthus Family

Carlowrightia texana J. Henrickson & T. Daniel. Texas carlowrightia. Native perennial. Rare in opening in upper-slope shrublands. Voucher: Carr & Candee 20969-B. Photo: SAM-115, SAM-116, SAM-117. Line drawing: Diggs et al. (1999), p. 215.

Dicliptera brachiata (Pursh) Spreng. Dicliptera. Native perennial. Rare in riparian woodlands. Voucher: Carr 20401. Photo: SAM-508. Line drawing: Diggs et al. (1999), p. 215.

Dyschoriste linearis (T. & G.) O. Ktze. Snake-herb. Native perennial. Rare, local in upper-slope shrublands at N29°06.002', W098°10.017' +/- 11.3 ft. Voucher: Carr 21213. Photo: SAM-1072. Line drawing: Diggs et al. (1999), p. 215.

Justicia pilosella (Nees) Hilsenbeck [*Siphonoglossa pilosella* Nees]. Hairy tubetongue. Native perennial. Quite common in upland woodlands and openings; frequent in upper-slope shrublands; occasional elsewhere. Voucher: Carr 20239. Photos: SAM-092, SAM-148, SAM-299, SAM-300, SAM-793. Line drawing: Diggs et al. (1999), p. 217.

Ruellia nudiflora (Engelm. ex Gray) Urban var. *nudiflora*. Wild-petunia. Native perennial. Locally common on banks and terraces along Picosa Creek. Voucher: Carr & Carré 19841. Photo: SAM-044, SAM-045, SAM-046. Line drawing: Diggs et al. (1999), p. 217.

Aceraceae Maple Family

Acer negundo L. var. *texanum* F. Pax. Box-elder maple. Native tree. Frequent in deciduous woodlands on river terraces. Voucher: Carr & Candee 20943. Photo: SAM-505. Line drawing: Diggs et al. (1999), p. 223.

Agavaceae Agave Family

Manfreda maculosa (Hook.) Rose [*Polianthes maculosa* (Hook.) Shinners]. Spotted false-aloe. Native perennial. Rare in upper-slope shrublands. Voucher: Carr & Candee 20956. Photos: SAM-864, SAM-865. Line drawing: a similar species, *Manfreda virginica*, appears on p. 1081 of Diggs et al. (1999).

Yucca constricta Buckl. Buckley yucca. Native shrub. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr & Candee 20959. Photo: SAM-040, SAM-041, SAM-042. Line drawing: Diggs et al. (1999), p. 1081.

Yucca treculeana Carr. Spanish dagger. Native shrub. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20511. Photo: SAM-322, SAM-323, SAM-1134. Line drawing: Diggs et al. (1999), p. 1089.

Amaranthaceae Amaranth Family

Alternanthera philoxeroides (Mart.) Grisebach. Alligator-weed. Naturalized perennial. Rare on sunny sandy lower bank of San Antonio River, at and in vicinity of N29°05.960', W098°09.608'. Voucher: Carr, Benesh & Gallyoun 21084. Photo: SAM-905. Line drawing: Diggs et al. (1999), p. 223.

Amaranthus polygonoides L. [*Amaranthus berlandieri* (Moq.) Uline & Bray; *Amaranthus polygonoides* L. var. *berlandieri* (Moq.) Thell.] Berlandier amaranth, tropical amaranth. Native annual. Locally common (in July 2002) in parking area at monument. Voucher: Carr & Benesh 21172. Photo: SAM-941, SAM-992. Line drawing: Diggs et al. (1999), p. 229.

Celosia nitida Vahl. Albahaca. Native perennial. Rare on shaded gully slopes. Voucher: Carr 21368. Photo: SAM-898.

Froelichia gracilis (Hook.) Moq. Slender snake-cotton. Native annual. Rare (at least in spring 2002) in opening in upper-slope shrubland. Voucher: Carr 21142. Photo: SAM-767. Line drawing: Diggs et al. (1999), p. 229.

Anacardiaceae Pistachio Family

Toxicodendron radicans (L.) Kuntze [*Toxicodendron rydbergii* (Small ex Rydb.) Greene; *Rhus radicans* var. *vulgaris* (Michx.) A. DC.]. Poison ivy. Native woody vine. Occasional in riparian woodland along Picosa Creek, more common in woodland along San Antonio River. Voucher: Carr, Benesh & Gallyoun 21088. Photo: SAM-126, SAM-127.

Apiaceae (Umbelliferae) Carrot Family

Bowlesia incana Ruiz & Pav. Hoary bowlesia. Native annual. Abundant during early spring in riparian woodlands, apparently shunned by cattle and increasing under current grazing regime. Voucher: Carr 20528. Photo: SAM-587, SAM-694, SAM-695. Line drawing: Diggs et al. (1999), p. 245.

Chaerophyllum tainturieri Hook. var. *tainturieri*. Chervil. Native annual. Occasional in riparian woodlands; also occasional in various upland sites. Voucher: Carr 20518. Photo: SAM-575, SAM-576. Line drawing: Diggs et al. (1999), p. 247.

Daucus pusillus Michx. Little carrot, rattlesnake weed. Native annual. Frequent in open areas on uplands and upper slopes. Voucher: Carr 20687. Photos: SAM-772, SAM-773. Line drawing: Diggs et al. (1999), p. 251.

Torilis arvensis (Huds.) Link. Tall sockbane, hedge-parsley. Naturalized annual. Occasional to locally common throughout. Photos: SAM-800, SAM-801. Line drawing: Diggs et al. (1999), p. 263.

Apocynaceae Dogbane Family

Apocynum cannabinum L. Dogbane. Native perennial. Rare, one colony of numerous plants along E bank of Picosa Creek ca. 0.2 mi N of San Antonio River (within view of new N fenceline), at N029°05.969', W098°09.840' +/- 20.0 ft. Line drawing: Diggs et al. (1999), p. 267.

Aristolochiaceae Birthwort Family

Aristolochia erecta L. [*Aristolochia longiflora* Engelm. & Gray]. Swanflower, grassleaf pipevine. Native perennial. Rare in old fields and openings in upland woodlands and upper-slope shrublands. Voucher: Carr 21141. Photo: SAM-123, SAM-124, SAM-757, SAM-758.

Asclepiadaceae Milkweed Family

Asclepias oenotheroides (Cham.) Schlecht. Hierba de zizotes. Native perennial. Rare in old fields and openings in upland woodlands. Voucher: Carr 20211. Photos: SAM-388, SAM-389, SAM-390, SAM-808, SAM-967. Line drawing: Diggs et al. (1999), p. 279.

Cynanchum barbigerum (Scheele) Shinners. Bearded swallow-wort. Native herbaceous perennial vine. Occasional in upper-slope shrublands. Voucher: Carr 20227. Photo: SAM-794. Line drawing: Diggs et al. (1999), p. 281.

Matelea reticulata (Engelm. ex Gray) Woodson. Pearl milkvine. Native herbaceous perennial vine. Rare in woodlands and shrublands throughout. Voucher: Carr 20232. Photo: SAM-752, SAM-753. Line drawing: Diggs et al. (1999), p. 286.

Sarcostemma cynanchoides Dcne. [*Funastrum cynanchoides* (Dcne.) Schltr.] White twinevine. Native herbaceous perennial vine. Rare in old fields, upland woodlands and riparian

woodlands. Voucher: Carr 20080. Photo: SAM-1101. Line drawing: Diggs et al. (1999), p. 285.

Asteraceae (Compositae) Sunflower Family

Amblyolepis setigera DC. Huisache daisy. Native annual. Common during spring in upland woodlands and upper-slope shrublands; locally abundant in roadbeds and mown firebreaks along fencelines. Voucher: Carr & Benesh 20495. Photo: SAM-625, SAM-626, SAM-652. Line drawing: Diggs et al. (1999), p. 311.

Ambrosia confertiflora A. DC. Field ragweed. Native perennial. Locally common in old fields, upland woodland and upper slope shrublands. Voucher: Carr 20396. Photo: SAM-980. Line drawing: Diggs et al. (1999), p. 311.

Ambrosia psilostachya DC. [*Ambrosia cumanensis* Kunth in H. B. K.] Western ragweed. Native perennial. Occasional to locally common in old fields, upland woodlands, upper slope shrublands. Voucher: Carr 21217. Photo: SAM-201, SAM-202. Line drawing: Diggs et al. (1999), p. 311.

Ambrosia trifida L. Giant ragweed. Native annual. Common in riparian woodlands and along drainages. Voucher: Carr 21236. Photo: SAM-377. Line drawing: Diggs et al. (1999), p. 311.

Aphanostephus ramosissimus DC. Plains lazy-daisy. Native annual. Occasional in old fields, upland woodlands, and upper-slope shrublands. Voucher: Carr & Benesh 20494. Photo: SAM-584, SAM-585, SAM-590, SAM-629, SAM-727. Line drawing: Diggs et al. (1999), p. 313.

Aphanostephus riddellii T. & G. Riddell's lazy-daisy. Native perennial. Frequent to locally abundant in open areas in upper slope shrublands. Vouchers: Carr 20405; Carr & Westlund 20668. Photo: SAM-741, SAM-742. Line drawing: Diggs et al. (1999), p. 313.

Aphanostephus skirrhobasis (DC.) Trel. Arkansas lazy-daisy. Native annual. Locally common on Wilco soils in regularly mown portions of old field just inside gate along county road; absent from balance of tract? Voucher: Carr 20696. Line drawing: Diggs et al. (1999), p. 313.

Aster ericoides L. [*Symphyotrichum ericoides* (L.) Nesom]. Heath aster. Native perennial. Rare in upland woodlands and upper slope shrublands. Voucher: Carr 20397. Photo: SAM-521, SAM-522, SAM-525. Line drawing: Diggs et al. (1999), p. 317.

Aster subulatus Michx. var. *ligulatus* Shinners. Hierba del marrano. Native perennial. Rare in old field. Voucher: Carr 21365. Photo: SAM-1123. Line drawing: Diggs et al. (1999), p. 323.

Aster lanceolatus Willd. Woodland aster. Native perennial. Rare in riparian woodlands. Voucher: Carr 20403. Photo: SAM-561. Line drawing: Diggs et al. (1999), p. 317.

Astranthium integrifolium (Michx.) Nutt. Western daisy. Native annual. Rare (at least during dry spring 2002) in mown areas on Wilco soils and in openings in upper-slope shrublands. Voucher: Carr & Westlund 20664; Carr 20971. Photo: SAM-785.

Baccharis neglecta Britt. Roosevelt weed, jara dulce, willow baccharis. Native shrub. Rare on property, noted only in bottom of quarry and in fenceline along entrance easement. Voucher: Carr & Candee 21250. Photo:SAM-1089. Line drawing: Diggs et al. (1999), p. 323.

Baccharis texana (T. & G.) Gray. Prairie baccharis. Native shrub. Locally common in upper-slope shrublands; occasional in upland woodlands; rare in old fields. Vouchers: Carr 20082, Carr 20085, Carr 20215. Photo: SAM-464. Line drawing: Diggs et al. (1999), p. 323.

Calyptocarpus vialis Less. Prostrate lawnflower, straggler daisy. Native perennial. Frequent in riparian woodlands; occasional elsewhere. Vouchers: Carr 20706, Carr & Candee 20938. Photo: SAM-506, SAM-791. Line drawing: Diggs et al. (1999), p. 331.

Centaurea melitensis L. Malta star-thistle. Naturalized annual or biennial. Rare along roadbed through upland woodland. Vouchers: Carr 20711, Carr 20978. Photo: SAM-812. A line drawing, which makes this easily-overlooked weed appear to be some kind of monster thistle, appears on p. 331 of Diggs et al. (1999).

Chaptalia texana Greene [*Chaptalia nutans* (L.) Polák var. *texana* (Greene) Burkhart]. Nodding lettuce. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr 20513. Photo: SAM-691. Line drawing: Diggs et al. (1999), p. 337.

Chloracantha spinosa (Benth.) Nesom var. *spinosa* [*Aster spinosus Benth*.; *Erigeron ortegae* Blake var. *spinosa* (Benth.) Sundberg]. Spiny aster. Native perennial. Occasional on banks of Picosa Creek; rare in riparian woodlands. Voucher: Carr 20402. Photo: SAM-436. Line drawing: Diggs et al. (1999), p. 337.

Cirsium texanum Buckl. Texas thistle. Native annual. Common in upland areas but also present on slopes and bottoms. Voucher: Carr & Westlund 20669. Photo: SAM-745. Line drawing: Diggs et al. (1999), p. 343.

Conyza canadensis (L.) Cronq. Horseweed. Native annual. Rare in old fields and openings in riparian woodlands on sandy soils. Voucher: Carr & Candee 20930. Photo: SAM-001, SAM-002. Line drawing: Diggs et al. (1999), p. 343.

Coreopsis nuecensis Heller. Crown coreopsis. Native annual. Rare, a few dozen plants observed on 23 April 2002 in one small area in old field on entrance easement, ca. 300-400 ft. NE of gate on county road, ca. 300 ft. SW of drainage that bisects easement, at N29°05.506', W098°10.641' +/- 13.7 ft. Voucher: Carr 20693. Photos: SAM-783, SAM-784.

Coreopsis wrightii (Gray) Smith [*Coreopsis basalis* (Dietr.) Blake var. *wrightii* (Gray) Blake]. Rock coreopsis. Native annual. Occasional on uplands and upper slopes. Voucher: Carr & Westlund 20639. Photo: SAM-763. Line drawing: Diggs et al. (1999), p. 343.

Dyssodia pentachaeta (DC.) Small [*Thymophylla pentachaeta* (DC.) Small] Parralena, dogweed. Native annual or short-lived perennial. Rare in upper-slope shrublands. Voucher: Carr 20407. Line drawing: Diggs et al. (1999), p. 425.

Dyssodia tenuiloba (DC.) B. L. Robinson [*Thymophylla tenuiloba* (DC.) Small]. Bristleleaf dyssodia, tiny Tim. Native annual or short-lived perennial. Rare, local in old fields. Vouchers: Carr 20389, Carr 20390; these vouchers seem to represent two varieties. Photo: SAM-815. Line drawing: Diggs et al. (1999), p. 425.

Erigeron philadelphicus L. Philadelphia fleabane. Native perennial. Occasional in riparian woodlands and San Antonio River. Voucher: Carr 20517. Photo: SAM-605. Line drawing: Diggs et al. (1999), p. 355.

Eupatorium serotinum Michx. Late boneset, late thoroughwort. Native perennial. Rare on bank of Picosa Creek and along drainage crossing entrance easement. Voucher: Carr 21238. Photo: SAM-1102. Line drawing: Diggs et al. (1999), p. 357.

Evax verna Raf. [*Evax multicaulis* DC.] Roundhead rabbit-tobacco. Native annual. Occasional in open upland sites. Photo: SAM-814. Line drawing: Diggs et al. (1999), p. 357.

Fleischmannia incarnata (Walt.) King & Robinson [*Eupatorium incarnatum* Walt.]. Scandent thoroughwort. Native perennial herbaceous vine. Occasional under mesquite in upland woodlands, in shrub thickets on upper slopes, and in woodlands on terraces. Vouchers: Carr 20398; Carr 21336. Photo: SAM-1130. Line drawing: Diggs et al. (1999), p. 355.

Florestina tripteris DC. [*Palafoxia tripteris* (DC.) Shinners] White palafoxia. Native annual. Rare in bed of road along N fenceline and in upland woodland near monument. Voucher: Carr & Candee 21245. Photo: SAM-528, SAM-529, SAM-1111.

Gaillardia pulchella Foug. Firewheels, Indian blanket. Native annual. Frequent in upland sites. Voucher: Carr & Westlund 20656. Photo: SAM-782. Line drawing: Diggs et al. (1999), p. 361.

Gamochaeta pensylvanica (Willd.) Cabrera [*Gnaphalium pensylvanicum* Willd.] Pennsylvania cudweed. Native annual. Rare on sandy bank of San Antonio River. Voucher: Carr & Candee 20942. Line drawing: Diggs et al. (1999), p. 361.

Gutierrezia texana (A. DC.) T. & G. [*Xanthocephalum texanum* (A. DC.) Shinners]. Broomweed. Native annual. Common to locally abundant in upland woodlands and on open upper slopes. Voucher: Carr 20214. Photo: SAM-1103. Line drawing: Diggs et al. (1999), p. 367.

Helenium microcephalum DC. Smallhead sneezeweed. Native annual. Locally common on partially unshaded clay slopes within riparian woodland along Picosa Creek; less common on terraces of San Antonio River. Voucher: Carr, Benesh & Gallyoun 21075. Photo: SAM-888. Line drawing: Diggs et al. (1999), p. 367.

Helianthus annuus L. Common sunflower. Native annual. Occasional in dry sunny disturbed sites. Voucher: Carr 20237. Photo: SAM-038. Line drawing: Diggs et al. (1999), p. 371.

Heterotheca subaxillaris (Lam.) Britt. & Rusby [*Heterotheca latifolia* Buckl.]. Camphor goldenaster. Native annual. Rare in upland woodlands. Voucher: Carr 20236. Photo: SAM-490, SAM-491. Line drawing: Diggs et al. (1999), p. 373.

Krigia cespitosa (Raf.) K. L. Chambers [*Krigia oppositifolia* Raf.] Dwarf-dandelion. Native annual. Occasional during spring in old fields and road beds. Voucher: Carr & Benesh 20482. Line drawing: Diggs et al. (1999), p. 379.

Lactuca sp. Wild-lettuce. Native annual. Rare in riparian woodlands.

Liatris mucronata DC. Blazing star. Native perennial. Surprisingly frequent in shrublands on upper slopes. Voucher: Carr 20089. Photo: SAM-431. Line drawing: Diggs et al. (1999), p. 385.

Lygodesmia texana (T. & G.) Greene. Texas skeletonplant. Native perennial. Occasional in shrublands on upper slopes. Voucher: Carr & Westlund 20653. Photo: SAM-731, SAM-1007. Line drawing: Diggs et al. (1999), p. 385.

Parthenium confertum Gray. Lyreleaf parthenium. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr 21239. Photo: SAM-991.

Parthenium hysterophorus L. False ragweed. Native annual. Occasional in upland woodlands and upper-slope shrublands. Vouchers: Carr 20235; Carr 21338. Photo: SAM-008, SAM-009, SAM-183, SAM-184, SAM-1136. Line drawing: Diggs et al. (1999), p. 395.

Pinaropappus roseus (Less.) Less. Rock-lettuce. Native perennial. Rare in upper-slope shrublands. Photo: SAM-648, SAM-649. Line drawing: Diggs et al. (1999), p. 395.

Pyrrhopappus pauciflorus (D. Don) DC. [*Pyrrhopappus multicaulis* DC.] Texas false-dandelion, pata de leon. Native annual. Frequent in old fields and upland woodlands. Voucher: Carr & Benesh 20490. Photo: SAM-619, SAM-620. Line drawing: Diggs et al. (1999), p. 401.

Ratibida columnifera (Nutt.) Woot. & Standl. [*Ratibida columnaris* (Sims) D. Don]. Mexican hats. Native annual. Occasional in upland woodlands. Photo: SAM-090, SAM-091. Line drawing: Diggs et al. (1999), p. 401.

Rudbeckia hirta L. var. *angustifolia* (Moore) Perdue. Black-eyed Susan. Native annual. Frequent in upland woodlands; occasional in old fields. Voucher: Carr & Candee 20931. Photo: SAM-788. Line drawing: Diggs et al. (1999), p. 401.

Senecio ampullaceus Hook. Texas groundsel. Native annual. Rare, noted only on pile of sandy soil in parking area near monument. Voucher: Carr 20530. Line drawing: Diggs et al. (1999), p. 405.

Simsia calva (Engelm. & Gray) Gray. Bush sunflower. Native perennial. Common in upper-slope shrublands. Voucher: Carr 20231. Photos: SAM-445, SAM-446, SAM-761, SAM-762. Line drawing: Diggs et al. (1999), p. 407.

Sonchus asper (L.) Hill. Sow thistle. Naturalized annual. Occasional in old fields, upland woodlands and riparian woodlands. Voucher: Carr 20535. Photo: SAM-101, SAM-101, SAM-616. Line drawing: Diggs et al. (1999), p. 417.

Tetraneuris scaposa (DC.) Greene [*Hymenoxys scaposa* DC.]. Stemless bitterweed. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr & Benesh 20508. Photo: SAM-641; SAM-646, SAM-647.

Thelesperma ambiguum Gray. Greenthread. Native perennial. Rare in shrublands on upper slopes. Vouchers: Carr & Westlund 20652; Carr & Benesh 21173. Photo: SAM-740. Line drawing: Diggs et al. (1999), p. 423.

Verbesina encelioides (Cav.) Benth & Hook. f. ex Gray. Cowpen daisy. Native annual. Rare in upland old field. Voucher: Carr 20392. Photos: SAM-546, SAM-547. Line drawing: Diggs et al. (1999), p. 429.

Verbesina virginica L. Frostweed, iceplant. Native perennial. Occasional in upland woodlands, upper-slope shrublands and riparian woodlands. Voucher: Carr 20230. Photo: SAM-492, SAM-1065, SAM-1066. Line drawing: Diggs et al. (1999), p. 429.

Wedelia texana (Gray) B. L. Turner [*Wedelia hispida* of Texas authors; *Zexmenia hispida* of Texas authors]. Texas zexmenia. hairy zexmenia. Native perennial. Common in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr 20225. Photo: SAM-448. Line drawing: Diggs et al. (1999), p. 431.

Xanthisma texanum DC. Sleepy-daisy. Native annual. Occasional in old fields on sandier soils. Voucher: Carr 20206. Photo: SAM-458. Line drawing: Diggs et al. (1999), p. 431.

Xanthium strumarium L. Abrojo, cocklebur, porcupine eggs. Native annual. Occasional in bed of Picosa Creek. Voucher: Carr & Candee 21255. Photo: SAM-1116. Line drawing: Diggs et al. (1999), p. 431.

Berberidaceae Barberry Family

Berberis trifoliolata Moric. [*Mahonia trifoliolata* (Moric.) Fedde] Agarito. Native shrub. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20502. Photo: SAM-671. Line drawing: Diggs et al. (1999), p. 435.

Bignoniaceae Catalpa Family

Campsis radicans (L.) Seeman ex Bureau. Trumpet creeper. Native woody vine. Common in riparian woodlands, climbing into trees but also creeping through ground layer on heavily grazed portions on heavy clay soils along Picosa Creek. Voucher: Carr, Benesh & Gallyoun 21080. Photo: SAM-200. Line drawing: Diggs et al. (1999), p. 447.

Boraginaceae Borage Family

Cryptantha texana (A. DC.) Greene. Texas hiddenflower. Native annual. Rare, noted only on pile of sandy soil in parking area near monument. Voucher: Carr 20531. Line drawing: Diggs et al. (1999), p. 449.

Heliotropium indicum L. India turnsole, alacrancillo. Naturalized annual. Rare in cracked clay exposed in dry bed of Picosa Creek. Voucher: Carr 19902. Photo: SAM-889. Line drawing: Diggs et al. (1999), p. 451.

Lithospermum mirabile Small. Yellow puccoon. Native perennial. Rather frequent in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr 20513. Photo: SAM-642, SAM-643, SAM-645.

Tetraclea coulteri Gray. Coulter tetraclea. Native perennial. Frequent in openings in upper-slope shrublands. Vouchers: Carr 20092; Carr 21344. Photos: SAM-432, SAM-433, SAM-747.

Brassicaceae (Cruciferae) Mustard Family

Arabis petiolaris (Gray) Gray. Brazos rock-cress. Native annual. Rare in shrublands on upper slopes. Observed on 30 May 2001 (prior to beginning of project); not encountered during 2002. Line drawing: Diggs et al. (1999), p. 461.

Capsella bursa-pastoris (L.) Medik. Shepherd's purse. Naturalized winter annual. Rare in riparian woodlands. Voucher: Carr 20527. Line drawing: Diggs et al. (1999), p. 463.

Descurainia pinnata (Walt.) Britt. Tansy mustard. Native annual. Rare in fencelines along edges of old fields. Voucher: Carr & Benesh 20478. Line drawing: Diggs et al. (1999), p. 467.

Lepidium austrinum Small. Southern pepperweed. Native annual. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 20532. Photo: SAM-705, SAM-706. Line drawing: Diggs et al. (1999), p. 471.

Lesquerella argyraea (Gray) Wats. Bladderpod. Native annual. Rare in upper-slope shrublands. Voucher: Carr & Benesh 20507. Photo: SAM-650, SAM-651.

Bromeliaceae Bromeliad Family

Tillandsia recurvata L. Ballmoss. Native perennial epiphyte. Occasional in trees throughout, more common in riparian woodlands. Voucher: Carr & Candee 20969. Photo: SAM-326. Line drawing: Diggs et al. (1999), p. 1097.

Buddlejaceae Buddleja Family

Polypremum procumbens L. Juniperleaf, polly-prim. Native perennial. Rare in old field on sandy soils near gate along county road. Voucher: Carr 20682. Photo: SAM-781. Line drawing: Diggs et al. (1999), p. 483.

Cactaceae Cactus Family

Ferocactus setispinus (Engelm.) Benson [*Thelocactus setispinus* (Engelm.) E. F. Anderson. Hedgehog cactus, fish-hook cactus. Native shrub. Rare in slope shrublands, noted only in bed of old roadbed at N29°05.791', W098°09.927' +/- 21.4 ft. Photo: SAM-055, SAM-056, SAM-867, SAM-993, SAM-1055. Line drawing: Diggs et al. (1999), p. 495.

Opuntia engelmannii Salm-Dyck var. *lindheimeri* (Engelm.) Parfitt & Pinkava [*Opuntia lindheimeri* Engelm]. Lindheimer pricklypear. Native shrub. Occasional in upland woodlands and upper-slope shrublands. Photo: SAM-293, SAM-325. Line drawing: Diggs et al. (1999), p. 493.

Opuntia leptocaulis DC. Tasajillo, Christmas cactus, pencil cactus. Native shrub. Occasional in shrublands on upper slopes. Photo: SAM-261, SAM-869. Line drawing: Diggs et al. (1999), p. 493.

Opuntia macrorhiza Engelm. Plains pricklypear. Native shrub. Rare in old fields. Photo: SAM-870. Line drawing: Diggs et al. (1999), p. 493.

Campanulaceae Bellflower Family

Triodanis perfoliata (L.) Nieuw. var. *biflora* (Ruiz & Pav.) T. R. Bradley [*Triodanis biflora* (Ruiz & Pav.) Greene]. Venus' looking-glass. Native annual. Rare to occasional throughout. Vouchers: Carr & Benesh 20500; Carr 20679. Photo: SAM-804. Line drawing: Diggs et al. (1999), p. 505.

Caprifoliaceae Honeysuckle Family

Sambucus canadensis L. var. *canadensis*. Elderberry. Native shrub. Rare in riparian woodlands, mostly (only?) along San Antonio River. Voucher: Carr, Benesh & Gallyoun 21081. Photo: SAM-130, SAM-131, SAM-132, SAM-133, SAM-879, SAM-914. Line drawing: Diggs et al. (1999), p. 515.

Caryophyllaceae Pink Family

Polycarpon tetraphyllum (L.) L. Fourleaf manyseed. Naturalized annual. Rare, noted only in mown old field on Wilco soils along fenceline along county road. Voucher: Carr 20689. Photo: SAM-776. Line drawing: Diggs et al. (1999), p. 523.

Silene antirrhina L. Sticky catchfly, sleepy catchfly. Native annual. Rare in old fields and upland woodlands. Voucher: Carr 20684. Line drawing: Diggs et al. (1999), p. 526.

Stellaria media (L.) Vill. Common chickweed. Naturalized annual. Occasional in riparian woodlands. Voucher: Carr 20520. Photo: SAM-721. Line drawing: Diggs et al. (1999), p. 527.

Stellaria prostrata Baldw. Baldwin chickweed. Native annual. Rare in shaded gully headers. Voucher: Carr & Westlund 20650.

Celastraceae Staff-tree Family

Schaefferia cuneifolia Gray. Desert yaupon, panalero. Native shrub. Rare in upper slope shrublands around gully heads, e.g., at N29°05.860', W098°10.087' +/- 15.9 ft. Voucher: Carr 21138. Photo: SAM-514.

Chenopodiaceae Goosefoot Family

Chenopodium berlandieri Moq. Berlandier goosefoot. Native annual. Rare in upland woodlands and old fields. Vouchers: Carr & Carré 19839; Carr 21215. Photo: SAM-1042. Line drawing: Diggs et al. (1999), p. 537.

Commelinaceae Dayflower Family

Commelina erecta L. var. *angustifolia* (Michx.) Fern. Common dayflower. Native perennial. Rare in upper-slope shrublands and terrace woodlands. Voucher: Carr 20081. Photo: SAM-072, SAM-073, SAM-074. Line drawing: Diggs et al. (1999), p. 1099.

Tinantia anomala (Torr.) C. B. Clarke [*Commelinantia anomala* (Torr.) Tharp] Widow's tears, false dayflower. Native annual. Frequent in riparian woodlands. Voucher: Carr & Westlund 20643. Photo: SAM-574, SAM-603, SAM-719. Line drawing: Diggs et al. (1999), p. 1103.

Tradescantia sp. Spiderwort. Native perennial. Occasional along margins of old fields and in upland woodlands. Voucher: Carr & Benesh 20496. Photo: SAM-633, SAM-634.

Convolvulaceae Morning-glory Family

Convolvulus equitans Benth. Common bindweed. Native perennial herbaceous vine. Occasional in upland old fields and woodlands. Voucher: Carr & Westlund 20660. Photo: SAM-079, SAM-080, SAM-081. Line drawing: Diggs et al. (1999), p. 553.

Dichondra recurvata Tharp & M. C. Johnston. Tharp's ponyfoot. Native perennial. Occasional in old fields and upland woodlands. Voucher: Carr & Benesh 20479; Carr 20704. Photo: SAM-1076. Line drawing: Diggs et al. (1999), p. 553.

Evolvulus sericeus Swartz var. *sericeus*. Silky evolvulus. Native perennial. Occasional to frequent in upland woodlands and upper-slope shrublands. Voucher: Carr 21135. Photo: SAM-746. Line drawing: Diggs et al. (1999), p. 557.

Ipomaea cordatotriloba Dennstaedt [*Ipomaea trichocarpa* Ell. var. *trichocarpa*; *Ipomaea trichocarpa* Ell. var. *australis* O'Donnell; *Ipomaea trichocarpa* Ell. var. *torreyana* (Gray) Shinners]. Common morning-glory. Native perennial herbaceous vine. Occasional in old fields and upper-slope shrublands. Voucher: Carr 20972. Photo: SAM-075, SAM-076, SAM-077, SAM-180, SAM-181, SAM-182. Line drawing: Diggs et al. (1999), p. 557.

Cornaceae Dogwood Family

Cornus drummondii C. A. Mey. Roughleaf dogwood. Native shrub. Occasional in riparian woodlands. Voucher: Carr & Candee 20937. Photo: SAM-129, SAM-139, SAM-140; SAM-816. Line drawing: Diggs et al. (1999), p. 563.

Cucurbitaceae Gourd Family

Ibervillea lindheimeri (Gray) Greene. Balsam gourd, Lindheimer balsam-apple. Native perennial herbaceous vine. Rare, one plant in fenceline at gate on county road and a few plants in upland woodlands. Voucher: Carr 20688. Photos: SAM-515, SAM-775; SAM-909. Line drawing: Diggs et al. (1999), p. 571.

Melothria pendula L. Melonette, meloncito. Native annual herbaceous vine. Rare in riparian woodlands. Voucher: Carr & Candee 20936. Photo: SAM-417, SAM-418. Line drawing: Diggs et al. (1999), p. 571.

Cuscutaceae Dodder Family

Cuscuta sp. Dodder. Native annual vine. Apparently rare in area, only a few plants noted during surveys of 2001-2002; parasitic on *Liatris mucronata* in openings in upper-slope shrublands. Voucher: Carr 21342. Photo: SAM-1142.

Cyperaceae Sedge Family

Carex bulbostylis Mack. Globose caric-sedge. Native perennial. Frequent in riparian woodlands, heavily grazed by cattle. Vocuher: Carr & Westlund 20672. Line drawing: Diggs et al. (1999), p. 1117.

Carex planostachys Kunze. Cedar sedge. Native perennial. Frequent in upper-slope shrublands. Voucher: Carr & Benesh 20503. Line drawing: Diggs et al. (1999), p. 1129.

Carex tetrastachya Scheele [*Carex brittoniana* Bailey]. Britton sedge. Native perennial. Occasional to frequent in riparian woodlands. Voucher: Carr & Westlund 20673. Photo: SAM-806. Line drawing: Diggs et al. (1999), p. 1129.

Carex sp. [Sect. *Phaestoglochin*.] Sedge. Native perennial. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr & Westlund 20674.

Cyperus ochraceus Vahl. Umbrella-sedge. Native perennial. Rare in riparian woodlands. Photo: SAM-218, SAM-219.

Cyperus retroflexus Buckl. [*Cyperus uniflorus* T. & H.] One-flower flat-sedge. Native perennial. Occasional in old fields along easement road. Voucher: Carr & Benesh 21166. Photo: SAM-982. Line drawing: Diggs et al. (1999), p. 1141.

Cyperus rotundus L. Purple nutsedge. Naturalized perennial. Occasional in old fields along easement road. Voucher: Carr & Benesh 21187. Photo: SAM-404, SAM-405, SAM-966. Line drawing: Diggs et al. (1999), p. 1141.

Cyperus sp. Umbrella-sedge. Native perennial. Occasional in old fields along easement road along easement road. (cf. globulosus)

Ebenaceae Ebony Family

Diospyros texana Scheele. Texas persimmon. Native shrub. Common in upper slope shrublands but also present in upland woodlands and terrace woodlands. Voucher: Carr & Benesh 20501. Photo: SAM-310, SAM-516, SAM-1059. Line drawing: Diggs et al. (1999), p. 583.

Euphorbiaceae Spurge Family

Acalypha ostryifolia Riddell. Hornbeam copperleaf. Native annual. Rare in upland woodlands. Voucher: Carr 21216. Photo: SAM-501. Line drawing: Diggs et al. (1999), p. 587.

Argythamnia humilis (Engelm & Gray) Muell. Arg. var. *humilis* [*Ditaxis humilis* (Engelm. & Gray) Pax var. *humilis*]. Low wild-mercury. Native perennial. Occasional in small openings in upland woodland. Voucher: Carr 21140. Photo: SAM-949. Line drawing: Diggs et al. (1999), p. 603.

Cnidoscolus texanus (Muell. Arg.) Small. Texas bull-nettle. Native perennial. Rare in opening in upper-slope shrubland along upper margin of shallow drainage at N29°05.775', W098°10.008'. Voucher: Carr & Candee 21249. Photo: SAM-947. Line drawing: Diggs et al. (1999), p. 601.

Croton capitatus Michx. Hog croton. Native annual. Occasional in old fields; rare in upland woodlands and on clay bars in bed of Picosa Creek. Voucher: Carr, Benesh & Gallyoun 21078. Photo: SAM-455. Line drawing: Diggs et al. (1999), p. 601.

Croton glandulosus L. Toothed croton. Native annual. Rare in old fields and upland woodlands. Voucher: Carr & Benesh 21184. Photo: SAM-984. Line drawing: Diggs et al. (1999), p. 601.

Croton monanthogynus Michx. One-seed croton, prairie tea. Native annual. Common in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20206-B. Photo: SAM-1000. Line drawing: Diggs et al. (1999), p. 603.

Euphorbia dentata Michx. [*Poinsettia dentata* (Michx.) Kl. & Gke.] Toothed spurge. Native annual. Occasional throughout. Voucher: Carr 20223. Photos: SAM-078, SAM-371, SAM-372, SAM-969. Line drawing: Diggs et al. (1999), p. 607.

Euphorbia glyptosperma Engelm. [*Chamaesyce glyptosperma* (Engelm.) Small]. Spurge. Native annual. Occasional in sandy clay of roadbeds and openings in upland woodlands and upper-slope shrublands. Vouchers: Carr 19900; Carr 20715; Carr 20975; Carr 21244; Carr 21343. Line drawing: Diggs et al. (1999), p. 595.

Euphorbia nutans Lag. [*Chamaesyce nutans* (Lag.) Small] Eyebane, nodding spurge. Native annual. Curiously rare, one vegetative plant observed in clay exposed in dry bed of Picosa Creek, 13 June 2002. Photo: SAM-375, SAM-376, SAM-997, SAM-1148. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia peplidion Engelm. [*Tithymalus peplidion* (Engelm.) Small] Low spurge. Native annual. Rare on tract, noted only in fenceline along old field easement near gate. Voucher: Carr & Benesh 20489.

Euphorbia prostrata Ait. [*Chamaesyce prostrata* (Ait.) Small]. Hairy matspurge. Native annual. Frequent in roadbeds; rare in clay in dry bed of Picosa Creek. Vouchers: Carr 19903, Carr 20209, Carr 20238. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia serpens Kunth [*Chamaesyce serpens* (Kunth) Small]. Smooth matspurge. Native annual. Apparently rare in old fields. Voucher: Carr 20391. Photo: SAM-1074, SAM-1105. Line drawing: Diggs et al. (1999), p. 597.

Euphorbia spathulata Lam. [*Tithymalus spathulatus* (Lam.) Weber] Warty spurge. Native annual. Rare in riparian woodland, one moldy plant observed on 26 Mar 2002. Line drawing: Diggs et al. (1999), p. 609.

Jatropha dioica Cerv. Rubberstem, sangre de drago. Native shrub. Rare in upper-slope shrubland, noted only on old roadbed on ridge on E side of quarry pit, N29°05.791', W098°09.927' and vicinity. Voucher: Carr & Westlund 20640. Photo: SAM-053, SAM-054.

Phyllanthus polygonoides Spreng. Knotweed leaf-flower. Native perennial. Rare in old fields, more common in upper slope shrublands and openings in upland woodlands. Vouchers: Carr & Westlund 20647; Carr 20982. Photo: SAM-998. Line drawing: Diggs et al. (1999), p. 613.

Tragia brevispica Engelm. & Gray. Climbing noseburn. Native perennial herbaceous vine. Occasional in upper-slope shrublands; rare in fenceline along easement road. Voucher: Carr 20229; Carr 21335. Photo: SAM-1100, SAM-1131. Line drawing: Diggs et al. (1999), p. 615.

Fabaceae (Leguminosae) Legume Family

Acacia greggii Gray var. *greggii*. Gregg acacia. Native shrub. Occasional in shrublands on upper slopes, e.g. at N29°05.835', W098°10.027' +/- 11.5 ft. Voucher: Carr & Candee 20957. Photo: SAM-868.

Acacia minuata (M. E. Jones) Beauchamp [*Acacia smallii* Isely; *Acacia farnesiana* of Texas authors]. Huisache. Native tree or large shrub. Occasional in old fields and riparian woodlands. Voucher: Carr 21092. Photo: SAM-868. Line drawing: Diggs et al. (1999), p. 627.

Acacia rigidula Benth. Blackbrush, chaparro prieto. Native shrub. Frequent in shrublands on upper slopes. Voucher: Carr 21099. Photo: SAM-910.

Astragalus nuttallianus DC. var. *trichocarpus* T. & G. Nuttall's milkvetch. Native annual. Occasional in less recently plowed portions of old fields. Vouchers: Carr & Benesh 20477; Carr 20720. Photos: SAM-670; SAM-797.

Astragalus nuttallianus DC. var. ?? Nuttall's milkvetch. Native annual. Occasional in upper-slope shrublands. [Smaller in all respects than the preceding; in flower (not fruit), 25 March 2002.]

Chamaecrista fasciculata (Michx.) Greene [*Cassia fasciculata* Michx.] Partridge-pea. Native annual. Occasional in old fields along easement road. Voucher: Carr 20205. Photo: SAM-457. Line drawing: Diggs et al. (1999), p. 641.

Dalea emarginata (T. & G.) Shinners [*Petalostemum emarginatum* T. & G.] Prairie-clover. Native perennial. Locally common in old field at SW end of entrance easement, i.e., just inside gate along county road. Vouchers: Carr 20690; Carr 20882. Photo: SAM-780.

Dalea pogonathera Gray. Bearded dalea, hierba de corazo. Native perennial. Occasional in openings in upland woodlands and upper-slope shrublands. Voucher: Carr 20395. Photo: SAM-1070, SAM-1104.

Desmanthus velutinus Scheele. Velvet bundleflower. Native perennial. Rare in upland woodlands and upper-slope shrublands. Vouchers: Carr 20090; Carr & Candee 20962. Photo: SAM-887. Line drawing: Diggs et al. (1999), p. 653.

Desmanthus virgatus (L.) Willd. var. *depressus* (Humb. & Bonpl.) B. L. Turner. Sharp-pod bundleflower. Native perennial. Occasional in old fields. Voucher: Carr 20974. Photo: SAM-137, SAM-138, SAM-1162. Line drawing: Diggs et al. (1999), p. 653.

Eysenhardtia texana Scheele. Texas kidneywood. Native shrub. Common in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr 20219. Photos: SAM-411, SAM-412, SAM-447, SAM-488. Line drawing: Diggs et al. (1999), p. 659.

Medicago lupulina L. Black medick. Naturalized annual. Occasional in openings in riparian woodlands. Voucher: Carr 20516. Line drawing: Diggs et al. (1999), p. 675.

Medicago polymorpha L. California burclover. Naturalized annual. Occasional in roadbeds and openings in riparian woodlands. Vouchers: Carr & Benesh 20498; Carr 20515. Line drawing: Diggs et al. (1999), p. 675.

Melilotus indicus (L.) All. Yellow sweet-clover. Naturalized annual. Common in roadbeds and old fields; occasional in upland woodlands. Voucher: Carr & Benesh 20497. Photo: SAM-631. Line drawing: Diggs et al. (1999), p. 675.

Mimosa borealis Gray. Fragrant mimosa. Native shrub. Rare in upper-slope shrublands. Voucher: Carr 21367. Line drawing: Diggs et al. (1999), p. 679.

Mimosa latidens (Small) B. L. Turner [*Schrankia latidens* (Small) K. Schum.] Sensitive-briar. Native perennial. Rare in old fields and upper-slope shrublands. Voucher: Carr, Benesh & Gallyoun 21074. Photo: SAM-737, SAM-886.

Prosopis glandulosa Torr. var. *glandulosa*. Honey mesquite. Native tree. Common in upland woodlands; frequent in upper-slope shrublands and also present in terrace woodlands. Voucher: Carr 21100. Photo: SAM-031, SAM-032. Line drawing: Diggs et al. (1999), p. 689.

Rhynchosia senna Hook. var. *texana* (T. & G.) M. C. Johnst. [*Rhynchosia texana* T. & G.] Texas snoutbean. Native perennial herbaceous vine. Rare in upper-slope shrublands. Voucher: Carr & Candee 21248. Photo: SAM-933. Line drawing: Diggs et al. (1999), p. 693.

Senna pumilio (Gray) Irwin & Barneby [*Cassia pumilio* Gray]. Dwarf senna. Native perennial. Apparently rare, two plants observed in upper-slope shrubland on 22 April 2002, neither collected. Photo: SAM-754. Line drawing: Diggs et al. (1999), p. 695.

Sesbania sp. Sesbania. Native annual. Rare, local on clay exposed in dry bed of Picosa Creek just S of northern fenceline. [Vegetative, 13 June 2002.]

Vicia ludoviciana Nutt. subsp. *leavenworthii* (T. & G.) Lasseter & Gunn [*Vicia leavenworthii* T. & G.] Leavenworth vetch. Native annual herbaceous vine. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20480. Line drawing: Diggs et al. (1999), p. 709.

Vicia ludoviciana Nutt. subsp. *ludoviciana*. Louisiana vetch. Native annual herbaceous vine. Occasional in riparian woodlands, particularly on sandy slopes along San Antonio River. Voucher: Carr 20521. Line drawing: Diggs et al. (1999), p. 709.

Fagaceae Beech Family

Quercus sp. (*Quercus virginiana* Mill. var. *virginiana*, *Quercus virginiana* Mill. var. *fusiformis* (Small) Sarg., or member of hybrid swarm). (Some kind of) Live oak. Native tree. Occasional but important in riparian woodlands; several large specimens along Picosa Creek. Voucher: Carr & Candee 21247. Photo: SAM-977. Line drawing: Diggs et al. (1999), p. 721.

Fumariaceae Fumitory Family

Corydalis sp. Scrambled eggs. Native annual. Rare in riparian and upland woodlands. Photo: SAM-597. Line drawing: Diggs et al. (1999), p. 721.

Gentianaceae Gentian Family

Sabatia campestris Nutt. Prairie rose-gentian. Native annual. Rare in old field on Wilco soils near gate along county road. Voucher: Carr 20692. Photo: SAM-779. Line drawing: Diggs et al. (1999), p. 729.

Geraniaceae Geranium Family

Geranium texanum (Trel.) A. Heller. Texas wild-geranium. Native annual. Occasional throughout in early spring. Voucher: Carr & Benesh 20488. Photo: SAM-672. Line drawing: Diggs et al. (1999), p. 731.

Hydrophyllaceae Waterleaf Family

Nama hispidum Gray. Sandbell, rough nama. Native annual. Rare in old fields and openings in upper-slope shrublands. Line drawing: Diggs et al. (1999), p. 745.

Nama jamaicense L. Fiddleleaf nama. Native annual. Occasional throughout. Voucher: Carr 20710. Photo: SAM-235, SAM-702. Line drawing: Diggs et al. (1999), p. 745.

Nemophila phacelioides Nutt. Blue eyes. Native annual. Occasional in riparian woodlands. Voucher: Carr 20525. Photo: SAM-582, SAM-583, SAM-688, SAM-689. Line drawing: Diggs et al. (1999), p. 745.

Phacelia congesta Hook. Blue curls. Native annual. Rare in shrublands on upper slopes. Photo: SAM-828. Line drawing: Diggs et al. (1999), p. 745.

Iridaceae Iris Family

Sisyrinchium langloisii Greene [incl. *Sisyrinchium pruinosum* Bickn.] Blue-eyed grass. Native perennial. Apparently rare, noted only in fenceline along margin of old fields. Voucher: Carr & Benesh 20491. Photo: SAM-674.

Juglandaceae Walnut Family

Carya illinoinensis (Wang) K. Koch. Pecan. Native tree. Occasional but important in riparian woodlands. Voucher: Carr & Candee 20948. Photo: SAM-212. Line drawing: Diggs et al. (1999), p. 751.

Krameriaceae Ratany Family

Krameria lanceolata Torr. Trailing ratany. Native perennial. Rare in openings in upper-slope shrublands. Voucher: Carr & Westlund 20665. Photo: SAM-768. Line drawing: Diggs et al. (1999), p. 757.

Lamiaceae (Labiatae) Mint Family

Hedeoma drummondii Benth. Limoncillo. Native perennial. Frequent in upland woodlands and upper-slope shrublands. Voucher: Carr & Westlund 20654. Photo: SAM-530. Line drawing: Diggs et al. (1999), p. 761.

Hedeoma hispida Pursh. Rough hedeoma. Native annual. Rare in upper-slope shrublands. Voucher: Carr & Westlund 20666. Line drawing: Diggs et al. (1999), p. 761.

Lamium amplexicaule L. Henbit. Naturalized annual. Occasional during spring in riparian woodlands. Photo: SAM-588, SAM-589, SAM-722. Line drawing: Diggs et al. (1999), p. 761.

Monarda punctata L. Spotted beebalm. Native annual. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20691. Photo: SAM-778. Line drawing: Diggs et al. (1999), p. 771.

Salvia ballotiflora Benth. Mejorana, shrubby blue sage. Native shrub. Rare in upper slope shrublands. Voucher: Carr & Westlund 20641. Photo: SAM-760, SAM-1112.

Salvia coccinea Buch. Scarlet sage, tropical sage. Native annual. Rare in riparian woodlands along Picosa Creek. Photo: SAM-437, SAM-1163. Line drawing: Diggs et al. (1999), p. 775.

Scutellaria drummondii Benth. Annual skullcap. Native annual. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 20705. Photo: SAM-635. Line drawing: Diggs et al. (1999), p. 781.

Scutellaria ovata Hill. Eggleaf skullcap. Native perennial. Rare in riparian woodlands. Voucher: Carr & Candee 20950. Line drawing: Diggs et al. (1999), p. 781.

Stachys crenata Raf. Shade betony. Native annual. Rare in riparian woodlands. Voucher: Carr 20529. Line drawing: Diggs et al. (1999), p. 785.

Lemnaceae Duckweed Family

Lemna aequinoctialis Welw. Duckweed. Native annual. Floating among flotsam on surface of Picosa Creek 50-75 ft. N of confluence with San Antonio River. Voucher: Carr & Candee 21254. Photos: SAM-1114, SAM-1115. Line drawing: Diggs et al. (1999), p. 1188.

Liliaceae Lily Family

Allium canadense L. var. *canadense*. Canada wild-onion. Native perennial. Rare in riparian woodlands. Photo: SAM-720, SAM-723. Line drawing: Diggs et al. (1999), p. 1195.

Allium drummondii Regel. Drummond wild-garlic. Native perennial. Rare in upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20510. Line drawing: Diggs et al. (1999), p. 1199.

Cooperia drummondii Herb. Drummond rain-lily, cebolleta. Native perennial. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20234. Photo: SAM-367, SAM-368, SAM-374, SAM-973. Line drawing: Diggs et al. (1999), p. 1203.

Cooperia pedunculata Herb. Giant rain-lily. Native perennial. Occasional in upland woodlands, upper-slope shrublands and riparian woodlands. Voucher: Carr & Benesh 20512. Photo: SAM-690. Line drawing: Diggs et al. (1999), p. 1203.

Habranthus tubispathus (L'Her.) Traub [*Habranthus texanus* (Herb.) Steud., *Zephyranthes texana* Hook.] Copper rainlily, atamosco lily. Naturalized perennial. Rare in opening in upland woodland. Voucher: Carr 20216. Photo: SAM-465. Line drawing: Diggs et al. (1999), p. 1203.

Nothoscordum bivalve (L.) Britt. False garlic, crow poison. Native perennial. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20509. Photo: SAM-632, SAM-1095. Line drawing: Diggs et al. (1999), p. 1209.

Schoenocaulon drummondii Gray. Drummond green-lily, Drummond sabadilla. Native perennial. Rare in upland woodlands at N29°05.941', W098°10.080' and N29°05.935', W098°10.081'; observed with leaves and green fruit, 30 Oct 2001 and 12 August 2002. Voucher: Carr 21214. Photo: SAM-1073.

Linaceae Flax Family

Linum imbricatum (Raf.) Shinners. Shingle flax. Native annual. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20505. Photo: SAM-618, SAM-638, SAM-639.

Malvaceae Mallow Family

Abutilon fruticosum Guillemin & Perrottet [*Abutilon incanum* (Link.) Sweet]. Texas Indian-mallow. Native perennial. Occasional in upper-slope shrublands. Photo: SAM-533. Line drawing: Diggs et al. (1999), p. 803.

Abutilon wrightii Gray. Wright abutilon. Native perennial. Rare in upper slope shrublands. Voucher: Carr & Candee 21246. Photo: SAM-1113.

Callirhoe leiocarpa Martin. Poppy mallow. Native annual. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr, Benesh, Elliott & Carré 19754; Carr & Westlund 20657. Line drawing: Diggs et al. (1999), p. 809.

Malvastrum coromandelianum (L.) Gke. Threelobe false-mallow. Native perennial. Occasional throughout. Voucher: Carr, Benesh & Gallyoun 21086. Photo: SAM-007, SAM-262, SAM-263. Line drawing: Diggs et al. (1999), p. 813.

Malvaviscus arboreus Cav. var. *drummondii* (T. & G.) Schery. Turk's cap. Native perennial. Locally frequent in riparian woodlands; occasional in upland woodlands. Voucher: Carr 21218. Photo: SAM-003, SAM-004. Line drawing: Diggs et al. (1999), p. 817.

Rhynchosida physocalyx (Gray) Fryxell [*Sida physocalyx* Gray]. Spearleaf sida. Native perennial. Apparently rare on tract, noted only in roadbed through old fields on easement. Voucher: Carr 20717. Photos: SAM-093, SAM-094, SAM-297, SAM-298; SAM-795. Line drawing: Diggs et al. (1999), p. 819.

Sida abutifolia H. B. K. [*Sida filicaulis* T. & G.]. Creeping yellow sida. Native perennial. Occasional in old fields. Voucher: Carr & Candee 20967. Photo: SAM-329. Line drawing: Diggs et al. (1999), p. 819.

Sida spinosa L. Prickly sida. Native perennial. Occasional in old fields. Vouchers: Carr & Carré 19840; Carr & Benesh 21188. Photo: SAM-329, SAM-987, SAM-988. Line drawing: Diggs et al. (1999), p. 819.

Meliaceae Mahogany Family

Melia azedarach L. Chinaberry. Naturalized tree. Apparently rather uncommon at present in riparian woodlands: rare along Picosa Creek and only occasional along San Antonio River (e.g., at N29°05.903', W098°09.633', where 5-10 mature but small trees were observed on 13 June 2002). Voucher: Carr, Benesh & Gallyoun 21082. Photo: SAM-395, SAM-396, SAM-805. Line drawing: Diggs et al. (1999), p. 825.

Molluginaceae Carpetweed Family

Mollugo verticillata L. Green carpetweed. Native annual. Frequent in old fields and roadbeds on sandier soils; also on clay exposed in dry bed of Picosa Creek. Vouchers: Carr 20222;

Carr, Benesh & Gallyoun 21079; Carr 21243. Photo: SAM-986, SAM-1108. Line drawing: Diggs et al. (1999), p. 829.

Moraceae Mulberry Family

Morus alba L. White mulberry, Asian mulberry. Naturalized tree. Occasional in riparian woodlands. Voucher: Carr & Candee 20944. Photo: SAM-170, SAM-174. Line drawing: Diggs et al. (1999), p. 833.

Morus rubra L. Red mulberry. Native tree. Occasional in riparian woodlands. Voucher: Carr, Benesh, Elliott & Carré 19753. Photo: SAM-1147. Line drawing: Diggs et al. (1999), p. 833.

Nyctaginaceae Four-o'clock Family

Acleisanthes longiflora Gray. Angel trumpets. Native perennial. Common in upland woodlands and upper-slope shrublands. Voucher: Carr 20220. Photo: SAM-489, SAM-1098. Line drawing: Diggs et al. (1999), p. 837.

Acleisanthes obtusa (Choisy) Standl. Berlandier trumpets. Native perennial. Occasional to locally common in upland woodlands and upper-slope shrublands. Voucher: Carr & Candee 20111, Carr 20207. Photo: SAM-156, SAM-157, SAM-459, SAM-460, SAM-461, SAM-463, SAM-511, SAM-512.

Mirabilis linearis (Pursh) Heimerl. Slenderleaf four-o'clock, umbrella-wort. Native perennial. Rare in old fields. Voucher: Carr 20383. Photo: SAM-084, SAM-085, SAM-086, SAM-369. Line drawing: Diggs et al. (1999), p. 843.

Nyctaginea capitata Choisy. Scarlet muskflower. Native perennial. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20210. Photo: SAM-014, SAM-015, SAM-016, SAM-017, SAM-103, SAM-104, SAM-105, SAM-106. Line drawing: Diggs et al. (1999), p. 843.

Oleaceae Olive Family

Forestiera angustifolia Torr. Panalero, narrowleaf elbowbush, desert olive. Native shrub. Rather rare in upper-slope shrublands. Voucher: Carr & Candee 20963. Photo: SAM-1062.

Fraxinus berlandieriana DC. Fresno, ash. Native tree. Apparently rare in riparian woodland on terrace of San Antonio River; one mature tree and numerous seedlings at N29°05.837', W098°09.756 +/- 16.3 ft. Voucher: Carr & Candee 21252. Photo: SAM-847.

Menodora heterophylla (Moric.) DC. Redbud menodora. Native perennial. Occasional in old fields and along margins of upland woodlands. Voucher: Carr & Westlund 20641. Photos: SAM-756, SAM-802, SAM-803. Line drawing: Diggs et al. (1999), p. 853.

Onagraceae Evening-Primrose Family

Gaura brachycarpa Small. Shortfruit gaura. Native annual. Frequent in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20694. Line drawing: Diggs et al. (1999), p. 853.

Gaura parviflora Doug. Smallflower gaura. Native annual. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20699. Photo: SAM-790. Line drawing: Diggs et al. (1999), p. 857.

Oenothera laciniata Hill. Cutleaf evening-primrose. Native annual. Rare in old fields. Voucher: Carr & Benesh 20485. Photo: SAM-621, SAM-622. Line drawing: Diggs et al. (1999), p. 867.

Oenothera speciosa Nutt. Pink evening-primrose. Native perennial. Occasional in old fields. Voucher: Carr & Benesh 20484. Photo: SAM-673. Line drawing: Diggs et al. (1999), p. 867.

Oxalidaceae Wood-Sorrel Family

Oxalis dichondrifolia Gray. Ponyfoot oxalis. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr & Westlund 20659. Photo: SAM-430, SAM-636, SAM-637.

Oxalis dillenii Jacq. [*Oxalis stricta* L.] Yellow sour-clover. Native annual. Occasional throughout. Voucher: Carr & Candee 20939. Photo: SAM-393. Line drawing: Diggs et al. (1999), p. 871.

Oxalis drummondii Gray. Drummond wood-sorrel. Native perennial. Frequent in upland woodlands and upper-slope shrublands; occasional in riparian woodlands. Voucher: Carr 21237. Photo: SAM-402, SAM-403, SAM-1092. Line drawing: Diggs et al. (1999), p. 871.

Papaveraceae Poppy Family

Argemone sanguinea Greene. Prickly-poppy. Native annual. Occasional in openings in upland woodlands. Voucher: Carr 20712. Photo: SAM-640.

Passifloraceae Passionflower Family

Passiflora tenuiloba Engelm. Slimlobe passionflower. Native perennial herbaceous vine. Occasional in upper-slope shrublands. Vouchers: Carr 21210 (vegetative); Carr 21241 (flowering). Photo: SAM-739, SAM-1106. Line drawing: Diggs et al. (1999), p. 879.

Phytolaccaceae Pokeweed Family

Rivina humilis L. Pigeonberry. Native perennial. Rare in riparian woodlands. Voucher: Carr & Candee 20960. Photo: SAM-400, SAM-401, SAM-425, SAM-426, SAM-1137. Line drawing: Diggs et al. (1999), p. 885.

Plantaginaceae Plantain Family

Plantago hookeriana Fisch. & Mey. Hooker plantain. Native annual. Occasional in old fields and openings in upper-slope shrublands. Vouchers: Carr 20681. Photo: SAM-769. Line drawing: Diggs et al. (1999), p. 887.

Plantago rhodosperma Dcne. Redseed plantain. Native annual. Frequent in old fields, upland woodlands and riparian woodlands. Voucher: Carr 20519. Photo: SAM-700. Line drawing: Diggs et al. (1999), p. 887.

Plantago wrightiana Dcne. Wright plantain. Native annual. Rare in old fields. Voucher: Carr & Westlund 20667; Carr 20695. Line drawing: Diggs et al. (1999), p. 889.

Poaceae (Gramineae) Grass Family

Aristida purpurea Nutt. var. *longiseta* (Steud.) Vasey [*Aristida longiseta* Steud.] Long-awn threeawn, dogtowngrass. Native perennial. Occasional to locally common in old fields and upper-slope shrublands. Vouchers: Carr 20384; Carr & Westlund 20655. Photo: SAM-1075. Line drawing: Diggs et al. (1999), p. 1245.

Aristida purpurea Nutt. var. *purpurea* [incl. *Aristida roemeriana* Scheele]. Purple threeawn. Native perennial. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 20387; Carr & Westlund 20670. Photo: SAM-922. Line drawing: Diggs et al. (1999), p. 1245.

Avena sativa L. Oats. Introduced annual. Occasional volunteer in old fields. Voucher: Carr 20719. Photo: SAM-796. Line drawing: Diggs et al. (1999), p. 1249.

Bothriochloa ischaemum (L.) Keng var. *songarica* (Rupr.) Celerier & Harlan. King Ranch bluestem. Naturalized perennial. Frequent to locally abundant in upland woodlands and upper-slope shrublands. Voucher: Carr 20226. Photo: SAM-969. Line drawing: Diggs et al. (1999), p. 1249.

Bothriochloa laguroides (DC.) Herter subsp. *torreyana* (Steud.) Allred & Gould [*Bothriochloa saccharoides* (Sw.) Rydb. var. *torreyana* (Steud.) Gould]. Silver bluestem. Native perennial. Occasional to frequent in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20977. Photo: SAM-534. Line drawing: Diggs et al. (1999), p. 1249.

Bouteloua curtipendula (Michx.) Rydb. Sideoats grama. Native perennial. Frequent in upper-slope shrublands. Voucher: Carr 20228. Photos: SAM-344, SAM-345. Line drawing: Diggs et al. (1999), p. 1249.

Bouteloua rigidiseta (Steud.) Hitchc. Texas grama, mesquitegrass. Native perennial. Occasional in upland woodlands and upper-slope shrublands. Vouchers: Carr 20393, Carr & Westlund 20641. Photo: SAM-1068. Line drawing: Diggs et al. (1999), p. 1251.

Bouteloua trifida Thurb. Red grama. Native perennial. Locally frequent in upper-slope shrublands. Vouchers: Carr 21139; Carr 21345. Photo: SAM-948, SAM-1140. Line drawing: Diggs et al. (1999), p. 1251.

Bromus catharticus Vahl [*Bromus unioloides* (Willd.) Kunth]. Rescuegrass. Naturalized annual. Occasional to frequent throughout. Voucher: Carr 20534. Photo: SAM-678. Line drawing: Diggs et al. (1999), p. 1251.

Bromus japonicus Thunb. ex Murr. Japanese brome. Naturalized annual. Occasional in old fields. Voucher: Carr 20535. Line drawing: Diggs et al. (1999), p. 1255.

Buchloe dactyloides (Nutt.) Engelm. Buffalograss. Native perennial. Noted only in bottom of quarry but presumably also present, perhaps mixed with *Hilaria belangeri*, in upland sites. Voucher: Carr 21340. Photo: SAM-1045, SAM-1139. Line drawing: Diggs et al. (1999), p. 1255.

Cenchrus spinifex Cav. [*Cenchrus incertus* Curtis]. Sandbur grass. Native perennial. Occasional in old fields and upland woodlands. Voucher: Carr 20202. Photo: SAM-452. Line drawing: Diggs et al. (1999), p. 1255.

Chasmanthium latifolium (Michx.) Yates. Creek oats, inland sea oats. Native perennial. Occasional in riparian woodlands. Voucher: Carr & Candee 20949. Photo: SAM-125. Line drawing: Diggs et al. (1999), p. 1257.

Chloris ciliata Sw. Fringed chloris. Native perennial. Occasional in openings in upland woodlands and upper-slope shrublands. Voucher: Carr 20086.

Chloris cucullata Bisch. Hooded windmillgrass. Native perennial. Frequent in upland woodlands. Voucher: Carr 20201. Photo: SAM-153, SAM-154, SAM-453. Line drawing: Diggs et al. (1999), p. 1257.

Chloris verticillata Nutt. Tumble windmillgrass. Native perennial. Occasional in openings in upland woodlands. Voucher: Carr 20208. Photo: SAM-1063. Line drawing: Diggs et al. (1999), p. 1257.

Cynodon dactylon (L.) Pers. var. *dactylon*. Bermudagrass. Naturalized perennial. Common throughout except on slopes. Voucher: Carr & Candee 20946. Photo: SAM-033. Line drawing: Diggs et al. (1999), p. 1261.

Dichanthium annulatum (Forsk.) Stapf. var. *annulatum*. Kleberg bluestem. Naturalized perennial. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20224. Photo: SAM-067, SAM-068. Line drawing: Diggs et al. (1999), p. 1265.

Dichanthium sericeum (R. Br.) A. Camus. Silky bluestem. Naturalized perennial. Locally common in old fields. Voucher: Carr 20077. Photo: SAM-362, SAM-363, SAM-531.

Digitaria ciliaris (Retz.) Koel. [*Digitaria adscendens* (H.B.K.) Henrard]. Southern crabgrass. Naturalized perennial. Occasional in old fields, upland woodlands and riparian woodlands. Vouchers: Carr 20079; Carr 21235. Line drawing: Diggs et al. (1999), p. 1265.

Digitaria cognata (Schult.) Pilger subsp. *cognata* [*Leptoloma cognatum* (Schult.) Chase]. Fall witchgrass. Native perennial. Occasional in old fields and upper-slope shrublands. Voucher: Carr 20388. Photo: SAM-950. Line drawing: Diggs et al. (1999), p. 1265.

Elymus virginicus L. var. *virginicus*. Virginia wildrye. Native perennial. Common in riparian woodlands. Voucher: Carr & Westlund 20671. Photos: SAM-764, SAM-765. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis barrelieri Daveau. Mediterranean lovegrass. Naturalized annual. Rare in bed of road through entrance easement. Voucher: Carr 21366. Photo: SAM-1053. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis curtipedicellata Buckl. Gummy lovegrass. Native perennial. Occasional in old fields. Voucher: Carr 20076. Photo: SAM-1002. Line drawing: Diggs et al. (1999), p. 1271.

Eragrostis intermedia A. S. Hitchc. Plains lovegrass. Native perennial. Occasional in old fields, upland woodlands and upper-slope shrublands. Vouchers: Carr 20075; Carr 20385; Carr 20386. Photo: SAM-1057. Line drawing: Diggs et al. (1999), p. 1273. Some of these specimens approach *Eragrostis hirsuta* (Michx.) Nees (bigtop lovegrass), another native perennial.

Eragrostis secundiflora Presl. subsp. *oxylepis* (Torr.) S. D. Koch [*Eragrostis oxylepis* (Torr.) Torr. Red lovegrass. Native perennial. Frequent in old fields on sandier soils. Voucher: Carr 20204. Photo: SAM-454. Line drawing: Diggs et al. (1999), p. 1275.

Eragrostis sessilispica Buckl. Tumble lovegrass. Native perennial. Rare, noted only in sandy outwash from old quarry pit. Voucher: Carr 20404. Photo: SAM-1138. Line drawing: Diggs et al. (1999), p. 1275.

Eriochloa sericea (Scheele) Munro. Silky cupgrass. Native perennial. Rare in upper-slope shrublands. Voucher: Carr 21337. Photo: SAM-1132. Line drawing: Diggs et al. (1999), p. 1275.

Hilaria belangeri (Steud.) Nash. Curlymesquite. Native perennial. Frequent in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr 20394. Line drawing: Diggs et al. (1999), p. 1279.

Hordeum pusillum Nutt. Little barley, southwestern barley. Native annual. Occasional throughout. Voucher: Carr & Westlund 20697. Photo: SAM-787. Line drawing: Diggs et al. (1999), p. 1279.

Leptochloa dubia (Kunth) Nees. Green sprangletop. Native perennial. Apparently rare, noted only in shade of mesquite along top of gully header. Voucher: Carr 21341. Photo: SAM-1099, SAM-1143. Line drawing: Diggs et al. (1999), p. 1283.

Limnodea arkansana (Nutt.) L. H. Dewey. Ozarkgrass. Native annual. Occasional to frequent in all habitats except heavily grazed riparian woodlands. Voucher: Carr & Westlund 20662. Photo: SAM-730. Line drawing: Diggs et al. (1999), p. 1283.

Nassella leucotricha (Trin. & Rupr.) Pohl [*Stipa leucotricha* Trin. & Rupr.]. Texas wintergrass, speargrass. Native perennial. Common in upland woodlands, occasional elsewhere. Voucher: Carr 20701. Photo: SAM-971. Line drawing: Diggs et al. (1999), p. 1289.

Panicum capillarioides Vasey. Southern witchgrass. Native perennial. Rare, noted only in mown parking area near monument. Voucher: Carr 21334. Photo: [take photo of specimen when mounted].

Panicum hallii Vasey. Hall's panicum. Native perennial. Occasional in old fields and openings in upper-slope shrublands. Vouchers: Carr 20088; Carr 20698. Photo: SAM-370. Line drawing: Diggs et al. (1999), p. 1301.

Panicum oligosanthes Schult. [*Dichanthelium oligosanthes* (Scribn.) Gould]. Fewflower panicgrass. Native perennial. Occasional in riparian woodlands, mostly on sandier soils of San Antonio River terrace. Voucher: Carr, Benesh & Gallyoun 21083. Line drawing: Diggs et al. (1999), p. 1303.

Paspalum langei (Fourn.) Nash. Rustyseed paspalum. Native perennial. Rare in riparian woodlands. Voucher: Carr & Candee 20932. Photos: SAM-1047, SAM-1048. Line drawing: Diggs et al. (1999), p. 1307.

Paspalum pubiflorum Fourn. Hairyseed paspalum. Native perennial. Occasional in riparian woodlands. Voucher: Carr & Candee 20945. Photo: SAM-440. Line drawing: Diggs et al. (1999), p. 1309.

Paspalum urvillei Steud. Vaseygrass. Naturalized perennial. Occasional in riparian woodlands. Line drawing: Diggs et al. (1999), p. 1309.

Pennisetum ciliare (L.) Link [*Cenchrus ciliaris* L.] Buffelgrass. Naturalized perennial. Rare, a few plants in old field immediately inside gate along county road. Voucher: Carr 20984. Photo: SAM-340.

Phalaris caroliniana Walt. Carolina canarygrass. Native annual. Common in old fields and upland woodlands; rare in grazed riparian woodlands. Voucher: Carr 20680. Photo: SAM-771. Line drawing: Diggs et al. (1999), p. 1313.

Setaria leucopila (Scribn. & Merr.) K. Schum. Plains bristlegrass. Native perennial. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 20983. Photo: SAM-951. Line drawing: Diggs et al. (1999), p. 1321.

Setaria ramiseta (Scribn.) Pilg. [*Panicum ramisetum* Scribn.]. Bristlegrass. Native perennial. Rare in upland woodlands and upper-slope shrublands. Voucher: Carr 20714. Photo: SAM-985. Line drawing: Diggs et al. (1999), p. 1323.

Setaria scheelei (Steud.) Hitchc. Southwestern bristlegrass. Native perennial. Occasional in upland woodlands, upper-slope shrublands and riparian woodlands. Voucher: Carr 20221. Photo: SAM-173, SAM-175. Line drawing: Diggs et al. (1999), p. 1323.

Sorghum halepense (L.) Pers. Johnsongrass. Naturalized perennial. Common in old fields where probably planted as hay crop; also in upland woodlands. Voucher: Carr 20973. Photo: SAM-036, SAM-037. Line drawing: Diggs et al. (1999), p. 1325.

Sporobolus compositus (Poir.) Merr. var. *compositus* [*Sporobolus asper* (Michx.) Kunth var. *drummondii* (Trin.) Vasey] Meadow dropseed. Native perennial. Common in upper-slope shrublands. Voucher: Carr 21211. Photo: SAM-1069. Line drawing: Diggs et al. (1999), p. 1325.

Sporobolus cryptandrus (Torr.) Gray. Sand dropseed. Native perennial. Common in old fields on sandy soils; frequent in openings in upland woodlands and upper-slope shrublands. Vouchers: Carr 20074, Carr 20087. Line drawing: Diggs et al. (1999), p. 1325.

Trichloris pluriflora Fourn. [*Chloris pluriflora* (Fourn.) Clayton] Manyflower false-Rhodesgrass. Native perennial. Rare in upper-slope shrublands. Voucher: Carr & Candee 20952. Photo: SAM-994.

Tridens albescens (Vasey) Woot. & Standl. White tridens. Native perennial. Local in depressional areas in bottom of quarry. Voucher: Carr & Candee 21251. Photo: SAM-798. Line drawing: Diggs et al. (1999), p. 1331.

Tridens eragrostoides (Vasey & Scribn.) Nash. Lovegrass tridens. Native perennial. Rare in gully headers. Voucher: Carr 20406. Photo: SAM-1056.

Tridens muticus (Torr.) Nash var. *muticus* [*Triodia mutica* (Torr.) Scribn.] Slim tridens. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr 21136. Photo: SAM-1067. Line drawing: Diggs et al. (1999), p. 1331.

Tridens texanus (S. Wats.) Nash [*Triodia texana* S. Wats.] Texas tridens. Native perennial. Common in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr 20218. Photo: SAM-467, SAM-1058. Line drawing: Diggs et al. (1999), p. 1333.

Urochloa ciliatissima (Buckl.) R. D. Webster [*Brachiaria ciliatissima* Buckl.]. Fringed signalgrass. Native perennial. Rare, local in old field on Wilco soils just inside gate along county road. Voucher: Carr 20678. Line drawing: Diggs et al. (1999), p. 1333.

Urochloa fasciculata (Swartz) Webster [*Brachiaria fasciculata* (Swartz) Parodi; *Panicum fasciculatum* Swartz]. Browntop signalgrass. Native annual. Common in old fields; occasional in upland woodlands. Voucher: Carr 20212. Photo: SAM-363, SAM-382, SAM-383. Line drawing: Diggs et al. (1999), p. 1333.

Urochloa texana (Buckl.) Webster [*Brachiaria texana* (Buckl.) Blake; *Panicum texanum* Buckl.] Texas signalgrass, Texas millet. Native annual. Common in old fields, particularly those on sandier soils; occasional in upland woodlands. Voucher: Carr 20078. Photo: SAM-451. Line drawing: Diggs et al. (1999), p. 1337.

Vulpia octoflora (Walt.) Rydb. Sixweeksgrass. Native annual. Rare in old field at gate. Line drawing: Diggs et al. (1999), p. 1337.

Polemoniaceae Phlox Family

Gilia incisa Benth. Cutleaf gilia. Native perennial. Occasional in upper-slope shrublands. Voucher: Carr & Westlund 20661. Photo: SAM-728. Line drawing: Diggs et al. (1999), p. 889.

Phlox drummondii Hook. Drummond phlox. Native annual. Rare, noted (in 2002) only along fenceline near gate. Voucher: Carr & Benesh 20483. Photo: SAM-617. Line drawing: Diggs et al. (1999), p. 893.

Polygalaceae Milkwort Family

Polygala alba Nutt. White milkwort. Native perennial. Occasional in upper-slope shrublands; local on rock outcrops in old quarry. Voucher: Carr & Westlund 20655-B. Photo: SAM-736. Line drawing: Diggs et al. (1999), p. 895.

Polygala lindheimeri Gray. Lindheimer milkwort. Native perennial. Rare in upper-slope shrublands. Voucher: Carr 21212. Photo: SAM-1071. Line drawing: Diggs et al. (1999), p. 895.

Polygonaceae Knotweed Family

Polygonum punctatum Ell. [*Persicaria punctata* (Ell.) Small] Dotted smartweed. Native annual. Locally abundant on banks of Picosa Creek. Voucher: Carr & Candee 20113. Photo: SAM-4340. Line drawing: Diggs et al. (1999), p. 903.

Polygonum ramosissimum Michx. Knotweed. Native annual. Occasional on banks of Picosa Creek; in flower and early fruit, 14 Aug 2001, 21 Sep 2001. Voucher: Carr 19901. Line drawing: Diggs et al. (1999), p. 903.

Rumex pulcher L. Fiddle Dock. Naturalized perennial. Rare in bed of Picosa Creek and in minor drainages across entrance easement; also on sandy terrace of San Antonio River. Voucher: Carr 20970. Line drawing: Diggs et al. (1999), p. 907.

Portulacaceae Portulaca Family

Portulaca pilosa L. [*Portulaca mundula* I. M. Johnston] Chisme, shaggy portulaca. Native perennial. Rare in old field along easement road. Voucher: Carr 20203. Photo: SAM-952, SAM-1118. Line drawing: Diggs et al. (1999), p. 909.

Portulaca umbraticola H.B.K. Wingpod purslane, Chinese hat. Native annual. Rare along road through old field on entrance easement and around parking area at monument. Voucher: Carr & Benesh 21170. Photo: SAM-990. Line drawing: Diggs et al. (1999), p. 909.

Talinum aurantiacum Engelm. [*Talinum angustissimum* (Gray) Woot. & Standl.] Orange flameflower. Native perennial. Occasional in mesquite-dominated upland woodlands. Voucher: Carr 20093. Photo: SAM-466. Line drawing: Diggs et al. (1999), p. 909.

Primulaceae Primrose Family

Anagallis arvensis L. Scarlet pimpernel. Naturalized annual. Occasional in old fields. All individuals observed in 2002 were of the form sporting a dark blue or violet (rather than salmon-colored) corolla. Voucher: Carr & Benesh 20481. Photo: SAM-777. Line drawing: Diggs et al. (1999), p. 915.

Ranunculaceae Crowfoot Family

Anemone berlandieri Pritz. [*Anemone heterophylla* Nutt.] Tenpetal anemone. Native perennial. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr 20702. Photo: SAM-668, SAM-789. Line drawing: Diggs et al. (1999), p. 919.

Clematis drummondii T. & G. Old man's beard. Native perennial herbaceous vine. Occasional throughout. Voucher: Carr & Candee 20966. Photo: SAM-108, SAM-109, SAM-110; SAM-120, SAM-121, SAM-122. Line drawing: Diggs et al. (1999), p. 919.

Clematis pitcheri T. & G. Purple leatherflower. Native perennial herbaceous vine. Occasional in riparian woodlands. Photo: SAM-419, SAM-420, SAM-421. Line drawing: Diggs et al. (1999), p. 919.

Delphinium carolinianum Walt. White delphinium, larkspur. Native perennial. Rare in openings in upper-slope shrublands and in fencelines along old fields. Voucher: Carr & Westlund 20663. Photo: SAM-766. Line drawing: Diggs et al. (1999), p. 925.

Rhamnaceae Buckthorn Family

Colubrina texensis (T. & G.) Gray var. *texensis*. Texas colubrina, hog plum. Native shrub. A common component of shrublands on upper slopes; occasional in other habitats. Vouchers: Carr 20220-B; Carr 20703. Photo: SAM-039, SAM-734, SAM-738. Line drawing: Diggs et al. (1999), p. 935.

Condalia hookeri M. C. Johnston var. *hookeri*. Brasil, bluewood condalia. Native tree or tall shrub. A common component of shrublands on upper slopes; occasional in other habitats. Voucher: Carr 20399. Photo: SAM-313, SAM-314. Line drawing: Diggs et al. (1999), p. 935.

Ziziphus obtusifolius (Hook. ex T. & G.) Gray. Lotebush. Native shrub. Occasional in upper-slope shrublands and upland woodlands. Voucher: Carr & Candee 20955. Photo: SAM-312. Line drawing: Diggs et al. (1999), p. 939.

Rosaceae Rose Family

Crataegus sp. Hawthorn. Native tree or large shrub. Similar to downy haw (*Crataegus mollis* Scheele). Occasional in riparian woodlands. Voucher: Carr & Carré 19840-B. Photo: SAM-047, SAM-048, SAM-698. Line drawing: Diggs et al. (1999), p. 943.

Prunus texana Dietr. [*Prunus glandulosa* T. & G.] Texas peachbush. Native shrub. One individual with four shrubby clumps, the largest ca. 2 ft. tall, observed on 17 Sep 2001 and 23 April 2002, in old field on sandy soils, ca. 10-20 ft. SE of NE-SW road along entrance easement ca. 500 ft. NE of gate on County Rd. 144, at GPS point N029°05.537', W098°10.612' +/- 11.9 ft. Voucher: Carr 20081. Photo: SAM-449.

Rubus riograndis Bailey [*Rubus trivialis* Michx.] Southern dewberry. Native woody shrub. Occasional in riparian woodlands. Voucher: Carr 20524. Photo: SAM-532, SAM-701. Line drawing: Diggs et al. (1999), p. 957.

Rubiaceae Madder Family

Cephalanthus occidentalis L. var. *californicus* Benth. Common buttonbush. Native shrub. Occasional on banks of Picosa Creek. Voucher: Carr, Benesh & Gallyoun 21087. Photo: SAM-880. Line drawing: Diggs et al. (1999), p. 963.

Galium aparine L. Clingon bedstraw, cleavers. Native annual. Occasional in riparian woodlands; rare along drainage through old fields. Vouchers: Carr 20523; Carr 20700. Photo: SAM-1146. Line drawing: Diggs et al. (1999), p. 963.

Galium virgatum Nutt. Wand bedstraw. Native annual. Occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20487. Photo: SAM-735. Line drawing: Diggs et al. (1999), p. 965.

Hedyotis nigricans (Lam.) Fosb. var. *nigricans* [incl. *Hedyotis nigricans* var. *filifolia* (Chapm.) Shinners]. Prairie bluets. Native perennial. Rare in upper-slope shrublands. Voucher: Carr & Candee 20961. Photo: SAM-811. Line drawing: Diggs et al. (1999), p. 965.

Houstonia parviflora Holzinger ex Greenman [*Hedyotis greenmanii* Fosberg]. Greenman's bluet. Native annual. Rare in upper-slope shrublands. Voucher: Carr & Benesh 20506.

Richardia tricocca (T. & G.) Standl. [*Diodia tricocca* T. & G.] Prairie buttonweed. Native annual. Rare in old field on Wilco soils and in bottom of quarry pit. Voucher: Carr & Benesh 21185; Carr 21339. Photo: SAM-984, SAM-1135. Line drawing: Diggs et al. (1999), p. 971.

Rutaceae Citrus Family

Ptelea trifoliata L. Wafer ash. Native tree. Frequent in upper-slope shrublands and riparian woodlands. Voucher: Carr & Westlund 20651. Photo: SAM-128, SAM-315, SAM-751. Line drawing: Diggs et al. (1999), p. 977.

Thamnosma texanum (Gray) Torr. Texas desert-rue, Dutchman's breeches. Native perennial. Frequent in upper-slope shrublands; occasional in upland woodlands. Voucher: Carr & Benesh 20504. Photo: SAM-680. Line drawing: Diggs et al. (1999), p. 977.

Zanthoxylum hirsutum Buckl. Toothache tree, tickle-tongue. Native shrub or small tree. Rare, a few immature shrubs in fenceline along county road. Voucher: Carr 21090. Photo: SAM-981.

Salicaceae Willow Family

Populus deltoides Bart. ex Marsh. subsp. *deltoides*. Eastern cottonwood. Native tree. Occasional on high banks of San Antonio River and Picosa Creek. Voucher: Carr & Candee 20934. Photo: SAM-134, SAM-699. Line drawing: Diggs et al. (1999), p. 977.

Salix nigra Marsh. Black willow. Native tree. Occasional on banks of San Antonio River. Voucher: Carr & Candee 20935. Photo: SAM-206, SAM-207, SAM-715. Line drawing: Diggs et al. (1999), p. 981.

Sapindaceae Soapberry Family

Cardiospermum halicacabum L. Balloonvine. Native annual vine. Rare on bank of Picosa Creek; one plant observed on 14 Aug 2001. GPS point: N029°06.006', W098°09.832' +/- 21.7 ft. Photo: SAM-1159. Line drawing: Diggs et al. (1999), p. 981.

Sapindus saponaria L. var. *drummondii* (Hook. & Arn.) L. Benson [*Sapindus drummondii* Hook. & Arn.]. Western soapberry. Native tree. Occasional in riparian woodlands. Voucher: Carr & Benesh 21174. Photo: SAM-286, SAM-287, SAM-288, SAM-291, SAM-292. Line drawing: Diggs et al. (1999), p. 985.

Sapotaceae Sapodilla Family

Sideroxylon lanuginosum Michx. [*Bumelia lanuginosa* (Michx.) Pers.] Coma, gum bumelia, woolly-bucket bumelia. Native shrub or small tree. Occasional in upper-slope shrublands; fairly common as understory shrub in riparian woodlands. Voucher: Carr & Candee 20954. Photo: SAM-018, SAM-019, SAM-316, SAM-317. Line drawing: Diggs et al. (1999), p. 985.

Scrophulariaceae Figwort Family

Agalinis strictifolia (Benth.) Penn. [*Gerardia strictifolia* Benth.] South Texas gerardia. Native perennial. Frequent in old fields and upland woodlands; occasional in upper-slope shrublands. Voucher: Carr & Candee 20110. Photo: SAM-442, SAM-443, SAM-456.

Castilleja indivisa Engelm. Annual paintbrush. Native annual. Occasional in old fields, upper-slope shrublands and upland woodlands. Voucher: Carr & Benesh 20486. Photo: SAM-623, SAM-624. Line drawing: Diggs et al. (1999), p. 997.

Maurandya antirrhiniflora Willd. Snapdragonvine. Native perennial herbaceous vine. Occasional in upper-slope shrublands. Voucher: Carr & Candee 20964. Photos: SAM-444, SAM-749. Line drawing: Diggs et al. (1999), p. 1005.

Nuttallanthus texanus (Scheele) D. A. Sutton [*Linaria texana* Scheele]. Texas toadflax. Native annual. Rare in old fields. Voucher: D. Benesh s.n. Line drawing: Diggs et al. (1999), p. 1009.

Veronica peregrina L. Wandering veronica. Native annual. Occasional on mud bed of Picosa Creek and on sandy slopes along San Antonio River. Voucher: Carr 20526. Photo: SAM-696. Line drawing: Diggs et al. (1999), p. 1013.

Smilacaceae Greenbriar Family

Smilax bona-nox L. Saw greenbriar. Native woody vine. Occasional in upper-slope shrublands and riparian woodlands. Voucher: Carr & Candee 20953. Photo: SAM-809. Line drawing: Diggs et al. (1999), p. 1347.

Solanaceae Nightshade Family

Bouchetia erecta DC. Erect bouchetia. Native perennial. Rare in opening in upper-slope shrubland. Voucher: Carr & Westlund 20644. Line drawing: Diggs et al. (1999), p. 1019.

Capsicum annuum L. var. *aviculare* (Dierb.) D'Arcy & Eschbaugh [*Capsicum annuum* L. var. *glabriusculum* (Dun.) Heiser & Pickersgill] Chilipiquín, bird pepper. Native shrub. Rare in upland woodlands, upper-slope shrublands and riparian woodlands. Voucher: Carr 20233. Photo: SAM-1049, SAM-1050, SAM-1093. Line drawing: Diggs et al. (1999), p. 1019.

Chamaesaracha coronopus (Dun.) Gray. Green false ground-cherry. Native perennial. Rare in openings in upland woodlands and upper-slope shrublands. Vouchers: Carr & Westlund 20645; Carr 20709; Carr 21242. Photo: SAM-755, SAM-1107.

Lycium berlandieri Dun. Berlandier wolf-berry. Native shrub. Occasional in upper-slope shrublands; also in gully thickets. Voucher: Carr, Benesh & Gallyoun 21073. Photo: SAM-517, SAM-1160.

Physalis angulata L. Purplevein groundcherry. Native annual. Rare on clay exposed in dry bed of Picosa Creek and on sandy unshaded lower banks of San Antonio River. Voucher: Carr, Benesh & Gallyoun 21076. Photo: SAM-890. Line drawing: Diggs et al. (1999), p. 1025.

Physalis cinarascens (Dun.) Hitch. var. *cinarescens* [*Physalis viscosa* L. var. *cinarescens* (Dun.) Waterfall]. Clammy ground-cherry. Native annual. Rare to occasional in old fields, upland woodlands and upper-slope shrublands. Voucher: Carr & Westlund 20658. Photos: SAM-378, SAM-379. Line drawing: Diggs et al. (1999), p. 1025.

Solanum elaeagnifolium Cav. Silverleaf nightshade. Native perennial. Locally common in old field on Colibro soils; occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 21093. Photo: SAM-327, SAM-328, SAM-333. Line drawing: Diggs et al. (1999), p. 1033.

Solanum triquetrum Cav. Texas nightshade. Native shrub. Occasional in upland woodlands and upper-slope shrublands. Voucher: Carr 20217. Photo: SAM-438, SAM-439. Line drawing: Diggs et al. (1999), p. 1033.

Sterculiaceae Cacao Family

Hermannia texana Gray. Mexican mallow. Native perennial. Occasional in upper-slope shrublands. Vouchers: Carr 20091, Carr 20980. Photo: SAM-946.

Ulmaceae Elm Family

Celtis laevigata Willd. var. *laevigata*. Sugar hackberry. Native tree. Common in riparian woodlands; occasional elsewhere. Voucher: Carr & Candee 21253. Photo: SAM-284, SAM-384, SAM-385, SAM-686. Line drawing: Diggs et al. (1999), p. 1037.

Celtis laevigata Willd. var. *reticulata* (Torr.) Benson [*Celtis reticulata* Torr.]. Netleaf hackberry. Occasional in upland woodlands and gully headers. Voucher: Carr 21208. Photo: SAM-936, SAM-1064. Line drawing: Diggs et al. (1999), p. 1037.

Celtis pallida Torr. Granjeno, spiny hackberry. Native tree or large shrub. Frequent in upland woodlands and upper-slope shrublands; occasional in riparian woodlands. Vouchers: Carr 20213; Carr 20708. Photo: SAM-306. SAM-885.

Ulmus americana L. American elm. Native tree. Rare in riparian woodlands; one large old tree on terrace along San Antonio River. Voucher: Carr & Candee 20933. Photo: SAM-892. Line drawing: Diggs et al. (1999), p. 1041.

Ulmus crassifolia Nutt. Cedar elm. Native tree. Common in riparian woodlands; rare in upper-slope shrublands. Voucher: Carr & Candee 20112. Photo: SAM-441. Line drawing: Diggs et al. (1999), p. 1041.

Urticaceae Nettle Family

Parietaria pensylvanica Muhl. Cucumberweed, pellitory. Native annual. Frequent in riparian woodlands; occasional elsewhere. Voucher: Carr 20713. Photo: SAM-601, SAM-601, SAM-712. Line drawing: Diggs et al. (1999), p. 1045.

Urtica chamaedryoides Pursh. Stinging nettle. Native annual. Rare in riparian woodlands. Voucher: Carr 20522. Photo: SAM-697. Line drawing: Diggs et al. (1999), p. 1045.

Verbenaceae Vervain Family

Aloysia gratissima (Gill. & Hook.) Troncoso. Whitebrush. Native shrub. Rare in upper-slope shrublands and upland woodlands. Voucher: Carr 20707. Photo: SAM-792. Line drawing: Diggs et al. (1999), p. 1051.

Glandularia bipinnatifida (Nutt.) Nutt. [*Verbena bipinnatifida* Nutt.] Dakota vervain. Native perennial. Occasional in old fields and upland woodlands. Voucher: Carr & Benesh 20493. Photo: SAM-807. Line drawing: Diggs et al. (1999), p. 1051.

Glandularia pumila (Rydb.) Umber [*Verbena pumila* Rydb.]. Pink vervain, low vervain. Native annual. Occasional in old fields and upland woodlands. Voucher: Carr 20718. Photo: SAM-573. Line drawing: Diggs et al. (1999), p. 1051.

Glandularia quadrangulata (Heller) Umber. [*Verbena quadrangulata* Heller]. Small white vervain. Native annual. Frequent in old fields and upland woodlands. Voucher: Carr & Benesh 20492. Photo: SAM-586, SAM-627, SAM-628.

Lantana urticoides von Hayek [*Lantana horrida* of Texas authors, not Kunth]. Texas lantana. Native shrub. Occasional in upper-slope shrublands. Voucher: Carr 20685. Photos: SAM-347, SAM-348, SAM-450. Line drawing: Diggs et al. (1999), p. 1057.

Phyla nodiflora (L.) Greene [*Lippia nodiflora* (L.) Michx.; incl. *Phyla incisa* Small]. Fogfruit or frogfruit. Native perennial. Occasional in riparian woodlands. Voucher: Carr & Candee 20947. Photo: SAM-842. Line drawing: Diggs et al. (1999), p. 1057.

Verbena canescens Kunth. Gray vervain. Native perennial. Rare in upland woodlands and upper-slope shrublands. Line drawing: Diggs et al. (1999), p. 1059.

Verbena halei Small [*Verbena officinalis* L. subsp. *halei* (Small) Barber]. Texas vervain. Native perennial. Occasional in old fields, upland woodlands and openings in riparian woodlands. Voucher: Carr 20686. Photo: SAM-786. Line drawing: Diggs et al. (1999), p. 1059.

Verbena plicata Greene. Fanleaf vervain. Native perennial. Frequent in roadbeds, old fields, upland woodlands and upper-slope shrublands. Voucher: Carr & Benesh 20499. Photo: SAM-630, SAM-1141. Line drawing: Diggs et al. (1999), p. 1059.

Violaceae Violet Family

Hybanthus verticillatus (Ort.) Baill. Whorled green-violet. Native perennial. Rare in old field on Wilco soils near gate along county road. Voucher: Carr 20683. Photos: SAM-770, SAM-799. Line drawing: Diggs et al. (1999), p. 1063.

Viola sp. Violet. Native perennial. Rare in riparian woodland on sandy soils of San Antonio River terrace near NE corner of tract.

Viscaceae Mistletoe Family

Phoradendron tomentosum (DC.) Gray subsp. *tomentosum*. Mistletoe. Native woody parasite. Occasional in trees throughout, most commonly in older mesquite. Voucher: Carr 20400. Photo: SAM-249, SAM-1133. Line drawing: Diggs et al. (1999), p. 1067.

Vitaceae Grape Family

Ampelopsis arborea (L.) Koehne. Peppervine. Native woody vine. Occasional in riparian woodlands. Voucher: Carr & Candee 20940. Photo: SAM-134, SAM-135, SAM-191, SAM-192. Line drawing: Diggs et al. (1999), p. 1076.

Cissus incisa (Nutt.) Des Moul. Ivy tree-bine, cow-itch. Native woody vine. Rare in upper-slope shrublands and riparian woodlands. Voucher: Carr 21091. Photos: SAM-295, SAM-296, SAM-774, SAM-1144. Line drawing: Diggs et al. (1999), p. 1067.

Parthenocissus quinquefolia (L.) Planch. Virginia creeper. Native woody vine. Occasional in riparian woodlands. Voucher: Carr & Candee 20941. Photo: SAM-846. Line drawing: Diggs et al. (1999), p. 1071.

Vitis mustangensis Buckl. Mustang grape. Native woody vine. Frequent in riparian woodlands; occasional upslope. Voucher: Carr & Candee 20965. Photo: SAM-881. Line drawing: Diggs et al. (1999), p. 1073.

Zygophyllaceae Caltrop Family

Guaiacum angustifolium Engelm. [*Porlieria angustifolia* (Engelm.) Gray]. Guayacán. Native shrub. Occasional in upper-slope shrublands and on slopes of gullies. Voucher: Carr & Westlund 20638. Photo: SAM-318, SAM-319, SAM-320, SAM-759. Line drawing: Diggs et al. (1999), p. 1075.

Kallstroemia parviflora Nort. Warty caltrop. Native annual. Locally common in disturbed soils in roadbeds and parking area near monument. Voucher: Carr & Benesh 21169. Photo: SAM-989. Line drawing: Diggs et al. (1999), p. 1075.

Tribulus terrestris L. Puncture-vine, abrojo de flor amarilla. Naturalized annual. Rare in parking area at monument. Voucher: Carr & Benesh 21171. Photo: SAM-099, SAM-100. Line drawing: Diggs et al. (1999), p. 1075.

Literature Cited

Correll, D. S. and M. C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner. 1881 pp.

Diggs, G. M., Jr., B. L. Lipscomb and R. J. O'Kennon. 1999. Shinners and Mahler's illustrated flora of North-central Texas. Botanical Research Institute of Texas, Ft. Worth. 1626 pp.

Hatch, S. L., K. N. Gandhi, and L. E. Brown. 1990. Checklist of the vascular plants of Texas. Texas Agricultural Experiment Station, Texas A & M University, College Station. 158 pp.

Jones, S. D., J. K. Wipff and P. M. Montgomery. 1997. Vascular plants of Texas: a comprehensive checklist including synonymy, bibliography, and index. University of Texas Press, Austin. 404 pp.

b) Fauna – same as Missions FMU

E. Supplemental Infomation

1) Fire Call-Up List

All Emergencies and Ambulances	911
San Antonio Fire Dept.	
Fire Chief	210-207-8400
Emergency Mgmt.	210-207-8580
Fire Marshall/Fire Prevention	210-207-8410
Stinson Airport	210-923-4357
Wilson County Fire Marshall	830-393-7346
Floresville Volunteer Fire Dept.	830-393-3223
San Antonio Police Dept.	210-227-7201
Bexar County Sheriff	210-379-1224
Wilson County Sheriff (Rancho)	830-393-2535
Southeast Baptist Hospital (Missions area)	210-297-3000
Wilson Memorial Hospital (Rancho)	830-393-3122

2) Preparedness inventory.

SAAN FIRE EQUIPMENT INVENTORY

3 red packs
3 firebags
1 bladder bag
4 sleeping bags
3 fire shelters
4 fire shelter cases
8 Nomex shirts
13 Nomex pants
3 hard hats
1 Pulaski
1 Shovel
1 McCloud
2 Stihl chain saws
1 125-gallon slip on tank w/pump
1 Mark III pump
9 1” water hoses
11 1.5” water hoses

END OF INVENTORY

3) Cooperative agreements.

MEMORANDUM OF UNDERSTANDING
BETWEEN

U.S. FISH AND WILDLIFE SERVICE
REGION 2

AND
NATIONAL PARK SERVICE
INTERMOUNTAIN REGION

AND
TEXAS FOREST SERVICE

AND
THE NATURE CONSERVANCY,
TEXAS CHAPTER

AND
NATIONAL FORESTS AND GRASSLANDS
IN TEXAS

1. INTRODUCTION:

Federal and State Land management agencies have an obligation to provide for public protection from wildfire, and other "all risk" type incidents such as hurricanes, floods, and acts of terrorism. In turn, private conservation agencies, such as the Nature Conservancy that maintain fire management organizations and equipment, are in a unique position to provide certain assistance in the event of wildfires, floods, and hurricanes. These organizations also have responsibilities to sustain diverse and productive ecosystems. These ecosystems provide cultural, scientific and recreational needs for a diverse cross-section of Americans. In order to meet these responsibilities, agencies must work together, and when possible, provide support to other agencies in their conservation *efforts.*

II. PURPOSE:

The purpose of this MOU is to provide mutual support, cooperation and assistance between the U. S. Fish and Wildlife Service Region 2, Texas Forest Service, National Park Service Intermountain Region, National Forests and Grasslands in Texas, and The Nature Conservancy, Texas Chapter for prescribed fire management; fire prevention; fire preparedness; and for emergency management and assistance on incidents such as wildfire, floods, and hurricanes, at no cost to the benefiting agency. Support and assistance in the event of acts of terrorism will apply only to the Federal and State agencies and will not apply to the Nature Conservancy, Texas Chapter. This

MOU will also provide for technical support, and will allow each party *to* obtain equipment and appropriate personal safety items as necessary to ensure the safety *of* employees participating in interagency incident management efforts.

III. AUTHORITY:

This MOU is entered into under the authority provided in:

Reciprocal Fire Protection Act *of* May 27, 1955 (69 Stat. 66; 42 U.S.C 1856a) (F&WS, NPS, USFS)

Disaster Relief Act *of* May 22, 1974 (NPS)

Organic Act *of* August 1916 (16USC 1) (NPS)

Cooperative Forestry Assistance Act (16USC 2101) (USFS)

Federal Grant and Cooperative Agreement Act *of* 1977 [P.L. 960224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. *1003;31* U.S.C 6301 thru 6308)] (NPS)

Vernon's Texas Civil Statutes (Sub Chapter B. Section 88.106) (TFS)

IV. STATEMENT OF MUTUAL BENEFIT:

State and private lands, for which the State *of* Texas is responsible for protection, Nature Conservancy lands in Texas, for which the Conservancy is responsible, and Federal lands for which the Federal government is responsible, are intermingled and adjacent to each other throughout the State *of* Texas. Emergency incidents and their management, on these lands for which one agency is responsible for may present a threat *to,* or affect, lands for which the other agency is responsible.

Management *of* prescribed fire, wildland fire, or other emergency incidents, on one or another *of* the parties' land, could require greater resources and expertise than that party can handle. It is in the best interest *of* each party *to* have available service from the other party to aid and assist them in management *of,* preparation for, and response to, these incidents.

It is to the mutual advantage *of* the U.S. Fish and Wildlife Service, State *of* Texas, National Park Service, The Nature Conservancy Texas Chapter, and U.S. Forest Service to coordinate efforts for prevention, training *for,* detection, and suppression *of* wildfires; and management and training for other incidents and similar projects, to limit duplication and to improve efficiency and effectiveness. It is the intent *of* the parties hereto that State, Federal, and Nature Conservancy's Texas Chapter, resources be available to assist in the above activities on each others' lands, and on other lands upon which the Federal government provides fire suppression support including other

States, Canada, and Mexico; and with non-fire state and national emergencies and logistical support activities in this state and other states.

Each party will have the benefit *of* utilizing personnel and equipment *of* the other party as available at no *cost for* the first operational period, other than optional reimbursement for use *of* aircraft. (After the first operational period, costs would be reimbursable if covered in a separate Agreement.) Also, each can obtain training, equipment and services from the other that may not be otherwise available.

V. RESPONSIBILITIES:

1. Each party will designate a contact person for the implementation *of* this Memorandum *of* Understanding.
2. Each party may request prescribed fire management; fire prevention; fire preparedness or other emergency incident management resources *from* the other as necessary to meet management goals.
3. Each party may, at their discretion and upon mutual consent, participate in prescribed fire management; fire prevention; fire preparedness; and emergency incident management operations *of* another party, to *foster* knowledge and experience; and to further cooperation between organizations.
4. Personnel and equipment may be provided *from* one party to another as requested. Request and dispatch *of* personnel and equipment shall be at the discretion of the affected agency receiving the request.
5. Each party will provide *for* salary or wage *costs of* its own employees and operate and maintain its own equipment.
6. All personnel shall meet the qualification standards of the National Wildfire Coordinating Group for the positions that they will occupy.
7. Each agency may install the others radio frequency in its radios for use in cooperative activities. All federal licensing requirements will be followed.

VI. AGREEMENT TERM:

This MOU will remain in force for a period *of* five years *from* the date *of* execution.

VII. SPECIAL PROVISIONS:

A. This MOU is for the purpose of creating a cooperative effort among the parties, and shall not be construed as obligating funds, staff or other resources of one party to another party. This MOU is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between parties of this MOU will be handled by separate agreement (except as otherwise provided in this MOU) in accordance with applicable laws, regulations and procedures.

B. This MOU may be modified or amended as necessary upon written consent of all parties or may be terminated by any party after providing 60 day written notice to the other parties.

C. Property or equipment provided by one party to another party, pursuant to this agreement, remains the property of the providing party, unless a written agreement to the contrary is prepared.

D. Each party will be responsible for its actions, and the actions of its employees. The activities performed under this MOU shall be performed entirely at each parties own risk. Each party releases the other parties from the actions of its own employees. Each party waives all claims against every other party to this agreement for compensation from any loss, damage, personal injury, or death occurring as a consequence of the performance of this agreement.

E. Other fire management organizations, with state level responsibilities, may be added to this MOD upon agreement by the original signing parties, and signature of the responsible official for the new organization.

F. Modifications to this MOU may be processed by the Texas Forest Service as requested by any of the partner agencies. The Texas Forest Service will promptly communicate any proposed modifications to all parties to this agreement. Changes will not take effect until signed by all parties.

E. The designated contacts for this MOU are:

1. U.S. Fish and Wildlife Service
Jeff Whitney
Regional Fire Management Coordinator
P.O. Box 1306
Albuquerque, NM 87103
505-248-6865

2. National Park Service
Bob Lineback
Wildland Fire Specialist
P.O. Box 728
Santa Fe, NM 87504
505-988-6018

3. Texas Forest Service
Mark Stanford
Chief, Fire Operations
P.O. Box 310 Lufkin, TX 75902
936-639-8130

4. The Nature Conservancy of Texas
Wendy Ledbetter
Big Thicket Project Director

3888 Hwy. 327 West
Silsbee, Texas 77656
409-385-0445

5. U.S. Forest Service
Ron Haugen
Fire Management Officer
701N. First Street Lufkin, TX 75901
936-639-8547

In Witness Whereof, the parties have caused this Memorandum of Understanding to be executed as of the date of last signature below:

APPROVED:

U.S. FISH AND WILDLIFE SERVICE
REGION 2

BY: _____
Regional Director

Geoffrey Haskett
Signature

March 5, 2004
Date

NATIONAL PARK SERVICE
INTERMOUNTAIN REGION

BY: Steve Martin
IMR Regional Director

Steve Martin
Signature

3/23/04
Date

TEXAS FOREST SERVICE

BY: James B. Hull
Director

Signature

5-17-2004
Date

THE NATURE CONSERVANCY,
TEXAS CHAPTER

BY: Carter Smith
State Director

Carter Smith
Signature

July 5, 2004
Date

U.S. FOREST SERVICE

BY: Fred S. Salinas
Forest Supervisor

Fred S Salinas
Signature

May 27, 2004
Date

F. Wildland and Prescribed Fire Monitoring Plan.

The issues and threats that face the park are dynamic and extremely complex because of the park's urban setting and the resulting developmental stresses that are placed on it. At present, there is insufficient data and knowledge on the status and trends of park ecosystems, which further complicates management of natural resources.

Natural resource inventories (plants, animals, insects) are either recently completed or are lacking. Vegetation has been well studied on the park. Surveys were conducted in 1981 and 2002. Mammal and herptofauna surveys were completed in 2003. Bird and fish surveys are in progress.

The lack of data or understanding can make it difficult for park management to make well-informed and timely decisions on projects without knowing if or how these projects may negatively impact a facet of the park's natural resources.

Once all baseline surveys are complete it is essential that monitoring programs are established that can detect trends in the status of park ecosystems and natural resources. This in turn will aid in creating future management strategies. A "vital signs" monitoring program through the Gulf Coast Network for Inventory and Monitoring is planned.

G. Preattack plan.

The local fire departments will respond to any fires reported in the park. If necessary, the park has two law enforcement rangers that are red-carded for fire duty. An example of a "Delegation of Authority" letter follows below in the rare case that this authority might be needed.

II. Delegation of Authority

Y14

Subject: Delegation of Authority, _____ Wildland Fire Incident

To: _____, Incident Commander

I hereby delegate authority for the management of the _____ Wildland Fire Incident to you as Incident Commander of the _____ Type ____ IMT. This fire is currently burning on San Antonio Missions National Historical Park lands under the jurisdiction of the National Park Service. The local fire protection agencies for private property are _____.

You will report to the _____ Incident Base following the Agency Administrator's briefing on _____ at _____ am/pm at the _____ Office. Your team will assume full command of the incident following shift change at _____am/pm on _____.

I expect all suppression efforts will be executed in accordance with the selected strategy identified in the FSA prepare for the _____ incident. I, or my representative(s) will be available for daily review of the FSA throughout this incident.

I have designated the preserves FMO as my representative and assigned the Chief Ranger as the Resource Advisor to the incident.

Suppression objective priorities, as outlined in the FSA, are:

1. _____
2. _____
3. The Appropriate Management Strategy should match the complexity of the vegetation, visitation and use facilities, and adjacent private values. It should emphasize the use of natural barriers near the river, direct suppression with hoselays, and handline construction along the boundary. Dozer-plow units can be used for direct attack if urban interface values are threatened, but will require rehabilitation. Dozer-plow/blade units and other heavy equipment can be used along the boundary if fire behavior and adjacent values-at-risk warrant, but should be cleared by the park archeologist. ATVs and other light-ground-pressure equipment may be used along the boundary, and on interior roads and trails. Cross-country travel is also permitted if limited to direct attack along the flanks of a wildfire (from within the black), or mop-up adjacent to roads/trails/control lines. Aircraft may be used at Rancho de las Cabras, but avoid low-level flights over the missions. Water drops are acceptable, but chemical retardant should not be used. The use of fireline explosives is restricted.

Any _____ suppression tactics within the _____ area must be approved by me or my representative. The following areas are designated _____ habitat. Suppression activities within these areas should consider _____.

Effective management of costs commensurate with resource values to be protected and strategic direction of the FSA selected alternative is critical. A comptroller will be appointed and available to our staff. Property accountability should demonstrate adherence to National direction on acceptable fire loss/use rates.

Incident Resources will be responsible for Initial Attack within the Fire Management Unit and any spot fires on adjacent lands from the _____ Incident. The Texas Forest Service will assume Initial Attack responsibilities outside this specified area.

Resources committed to the fire are _____.

Fire information and media relations will be coordinated with the park information officer.

I request that personnel assigned to the incident be sensitive to the local community and request that as much purchasing as possible be done through local vendors.

I have included excerpts from the Fire Management Plan into the briefing documentation. Other documents that are pertinent to fire suppression efforts within the area include:

I welcome your team to San Antonio Missions National Historical Park and wish you a safe and successful assignment. You can reach me at 210-534-8833.

Superintendent,

H. Long-term prescribed fire and hazard fuel reduction plan.

1. Multi-year prescribed fire schedule.

none

2. Hazard fuels reduction areas and schedule (include proposed treatment techniques).

Area or Name	Acres	Date Completed	Methods
Mission Espada – North Wall	0.12	Summer 2004	Mechanical
Mission San José	0.3	October 2004	Mechanical
Parcel 104-40	3.5	August 27, 2004	Mechanical and chemical
Mission San José	23	Planned for 2005	Mechanical and chemical
San Juan Dam Site	27	Planned for 2006	Mechanical and chemical (3 ac.only)
Esparza Property	20	Planned for 2007	Mechanical and chemical
Espada Acequia	10	Planned for 2008	Mechanical and chemical
San Juan Acequia	10	Planned for 2008	Mechanical and chemical
Pooley Property	18	Planned for 2009	Mechanical and chemical

I. Fire Prevention Plan (see RM-18, Chapter 8).

1*)* *Fire Prevention Analysis*

A fire prevention analysis has been completed as part of the Wildland Fire Prevention Plan in accordance with RM 18. They will be reviewed annually and updated as necessary.

a) Objectives

1. To reduce the threat of human-caused fires through visitor and employee education.
2. To integrate the prevention message into interpretive programs.

The missions and acequia water system are located almost entirely within an urban area in excess of one million people. Some areas have wildland fuels, but adjoin highly developed residential and commercial areas. The park is still in its development phase and most areas are managed under cooperative agreements or purchased easements, with only a few in NPS fee simple ownership. These parcels create a discontinuous and patchwork area of fire control responsibility, and various jurisdictions. The objectives of this plan are to reduce the risk of human-caused fires through visitor, employee, and adjacent landowner education and cooperation.

General Actions:

The program will consist of the following elements: staff awareness, adjacent land owner education, enforcement of regulations, fire safety inspections, hazardous fuel reduction, cooperation with local fire departments, and related maintenance activities.

b) Fire Prevention Plan Review:

The fire prevention analysis and action plan shall be reviewed annually no later than September 1st. The plan will also be reviewed after boundary adjustments.

2) *Fire Prevention Action Plan*

High fire danger will be determined by using outputs from the NFDRS weather station at Lyndon B. Johnson NHP. Management will also consider: days since last precipitation event, amount of precipitation, fuel type, fuel moisture content (both live and dead), and fuel loading. The staffing level will also be adjusted for current fire activity and public use levels during holiday periods.

General Action Items:

1.	Employee meetings will include fire prevention information during the fire season.	Chief Ranger
2.	Facilities will be inspected annually with a member of San Antonio's Fire Department.	Chief Ranger
3.	Maintenance equipment will be inspected for proper functioning of spark arrests and exhaust systems.	All maintenance employees
4.	Maintenance crews will receive safety briefings covering fire prevention practices and required fire safety.	Maintenance Supervisor
5.	Employees that operate vehicles off paved roads will receive a safety briefing on the fire hazard of catalytic converters in open fields.	Division Chiefs and Supervisors
6.	All vehicles operated off pavement will be equipped with fire extinguishing equipment.	Division Chiefs
7.	Grass will be cut to a safe height prior to special events, paying particular attention to food cooking and parking areas.	Facility Manager
8.	Fire safety and evacuation plans will be prepared for all large special events.	Special Projects Officer
9.	Inspect all park fire extinguishers. Evaluate need for replacement, refilling, or additional extinguishers.	LE Rangers

3) *Fire Prevention Zone Ratings / Action Items*

FP ZONE #1 - MISSION CONCEPCIÓN AREA

Hazard	Low	Mowed fields, flat terrain, residential area.
Value	High	Residential area, historic mission structure, visitor contact station.
Risk	Moderate	Urban area with easy access, no known history of fire.

Specific Prevention Actions Required	Person Responsible
1. Cut grass to an appropriate height, especially during late summer and early fall when the grasses are curing.	Facility Manager
2. During routine patrols any accumulation of household trash and brush on properties will be noted.	LE Rangers
3. Advise visitors against smoking in hazardous areas.	Interpretive Park Rangers

FP ZONE #2 - MISSION SAN JOSÉ AREA

Hazard	Moderate	Mowed, and unmowed field with some brush, flat terrain, residential areas.
Value	High	Historic mission structure, Discovery Center structure, Visitor Center structure, maintenance supply yard, church office building and residences.
Risk	Moderate	Urban area with easy access, no known history of fire.

Specific Prevention Actions Required	Person Responsible
1. Cut grass cut to an appropriate height, especially during late summer and early fall when the grasses are curing.	Facility Manager
2. Maintain grass in overflow parking areas	Facility Manager

at a safe height.	
3. During routine patrols note any accumulation household trash.	LE Rangers
4. Advise visitors against smoking in hazardous areas.	Interpretive Park Rangers

FP ZONE #3 - ESPADA PARK & ACEOUIA PARK

Hazard	Moderate	Mowed and unmowed fields, brush, flat terrain.
Value	High	Adjacent to city park, cemetery and industrial sites (including refinery).
Risk	High	Urban area with easy access, picnic area with fire grates, high public use, adjacent industrial sites, adjacent railroad tracks.

Specific Prevention Actions Required	Person Responsible
1. Patrol area.	LE Rangers and City Park Police
2. Evaluate area for hazard fuel reduction needs.	Chief Ranger
3. Continue hazardous fuel reduction project	Chief Ranger

FP ZONE #4 - MISSION SAN JUAN AREA INCLUDING ESPADA AND SAN JUAN LABORES LOCATED BETWEEN ASHLEY ROAD & INTERSTATE 410

Hazard	Moderate	Mowed and unmowed fields with brush, riparian woodlands, trash dumps, flat terrain.
Value	High	Adjacent to residential areas, inholdings, farm fields, historic mission structures.
Risk	High	Urban area with easy access, high public use, residential trash burning, arson fires have occurred on adjacent lands.

Specific Prevention Actions Required	Person Responsible
1. Conduct patrols during high visitor use,. high fire danger.	LE Rangerst
2. Continue a manual hazardous fuel reduction program.	Chief Ranger
3. Continue to coordinate with adjacent landowners and promote fire safety and prevention.	Chief Ranger
4. Post fire danger warning signs at San	Chief of Interpretation

Juan Nature Trail as needed.

5. Advise visitors against smoking in hazardous areas.	Interpretive Park Rangers
6. Maintain grass to a safe height in overflow parking areas.	Facility Manager

ZONE #5 - MISSION ESPADA AREA

Hazard	Moderate	Mowed and unmowed fields, brush, trash dumps, flat terrain.
Value	High	Adjacent to residential areas, farm fields, historic mission structures.
Risk	High	Urban area with easy access, residential trash burning, agricultural burns on adjacent lands, adjacent to public park.

Specific Prevention Actions Required	Person Responsible
1. Keep grass cut to appropriate height, especially late summer and early fall when grasses are curing.	Facility Manager
2. Conduct patrols during high visitor use, or high fire danger.	LE Rangers
3. Continue a manual hazardous fuels program.	Chief Ranger
4. Advise visitors against smoking in hazardous areas.	Interpretive Park Rangers
5. Continue to coordinate with adjacent landowners and promote fire safety and prevention.	Chief Ranger

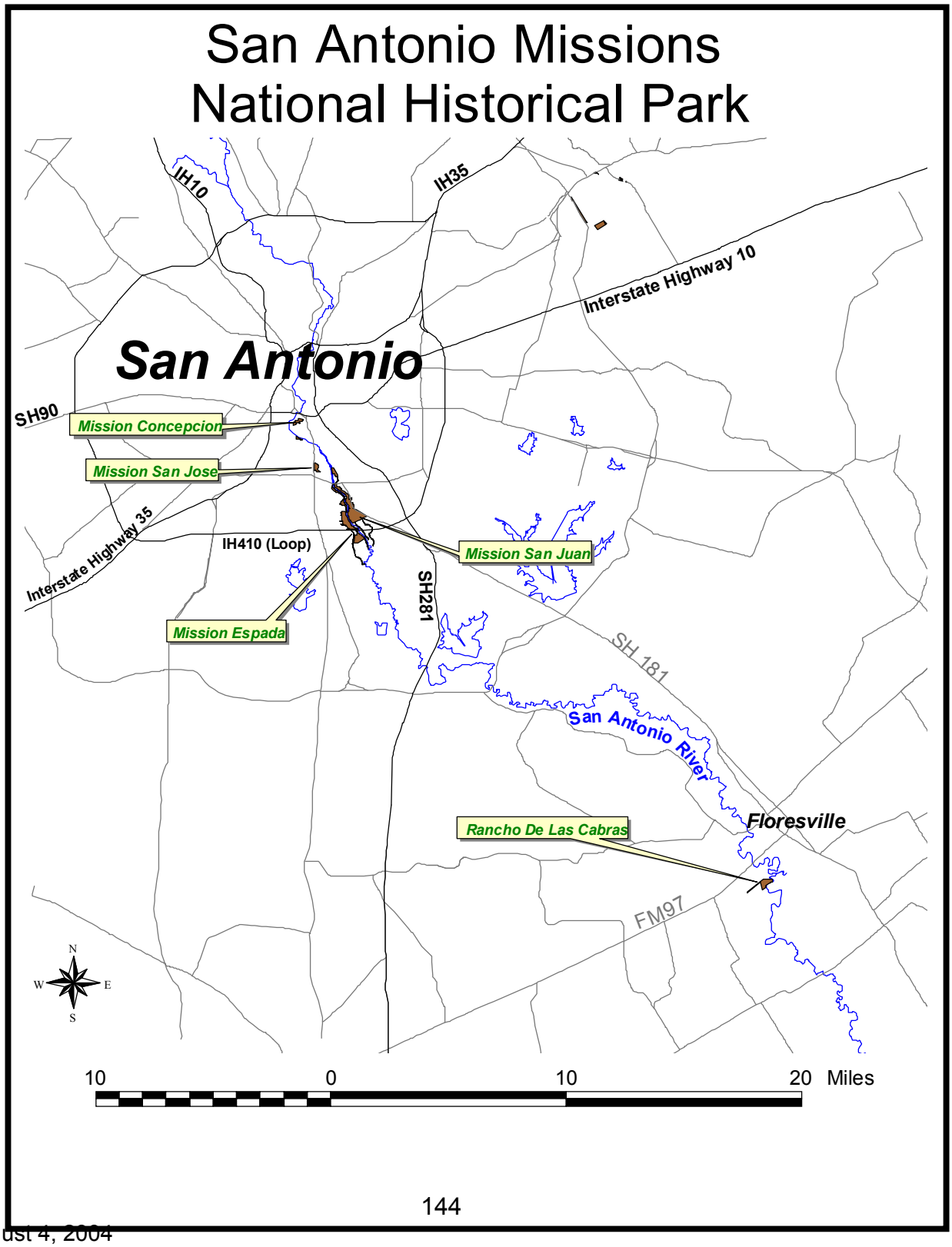
FP ZONE #6 - RANCHO de las CABRAS

Hazard	Moderate	Mowed and unmowed fields, brush, trash dumps, riparian woodland, flat terrain intersected by steep sided drainages.
Value	High	Adjacent to feedlot operation, residence, farm fields historic ruins.

Risk	Moderate	Rural area not readily accessible to public, residential trash dump and trash burning, agricultural burns on adjacent lands.

Specific Prevention Actions Required	Responsible Person
1. Conduct patrols bimonthly (increase during periods of high fire danger).	Chief Ranger
2. Cooperate with adjacent landowners on fire prevention and visitor use activities.	Chief Ranger
3. Utilize Planned Ignitions to reduce hazard fuels as determined by management team.	Superintendent

Natural ignitions are highly improbable around the missions, due to the frequently mowed lawns. Man caused ignitions occur due to recreation activities (picnics), accidents, arson, and debris burning on adjacent lands. While these ignitions are typically small, and quickly controlled, they have the potential to seriously damage cultural resources or to escape onto private lands. Management is committed to an aggressive prevention program, which recognizes the advantages of preventing ignitions rather than subsequent suppression actions. A detailed prevention plan is located in Appendix I.


San Antonio Missions
National Historical Park
IH10
IH35
Interstate Highway 10
San Antonio
SH90
Mission Concepcion
Mission San Jose
Interstate Highway 35
IH410 (Loop)
Mission San Juan
SH281
Mission Espada
SH 181
San Antonio River
Floresville
Rancho De Las Cabras
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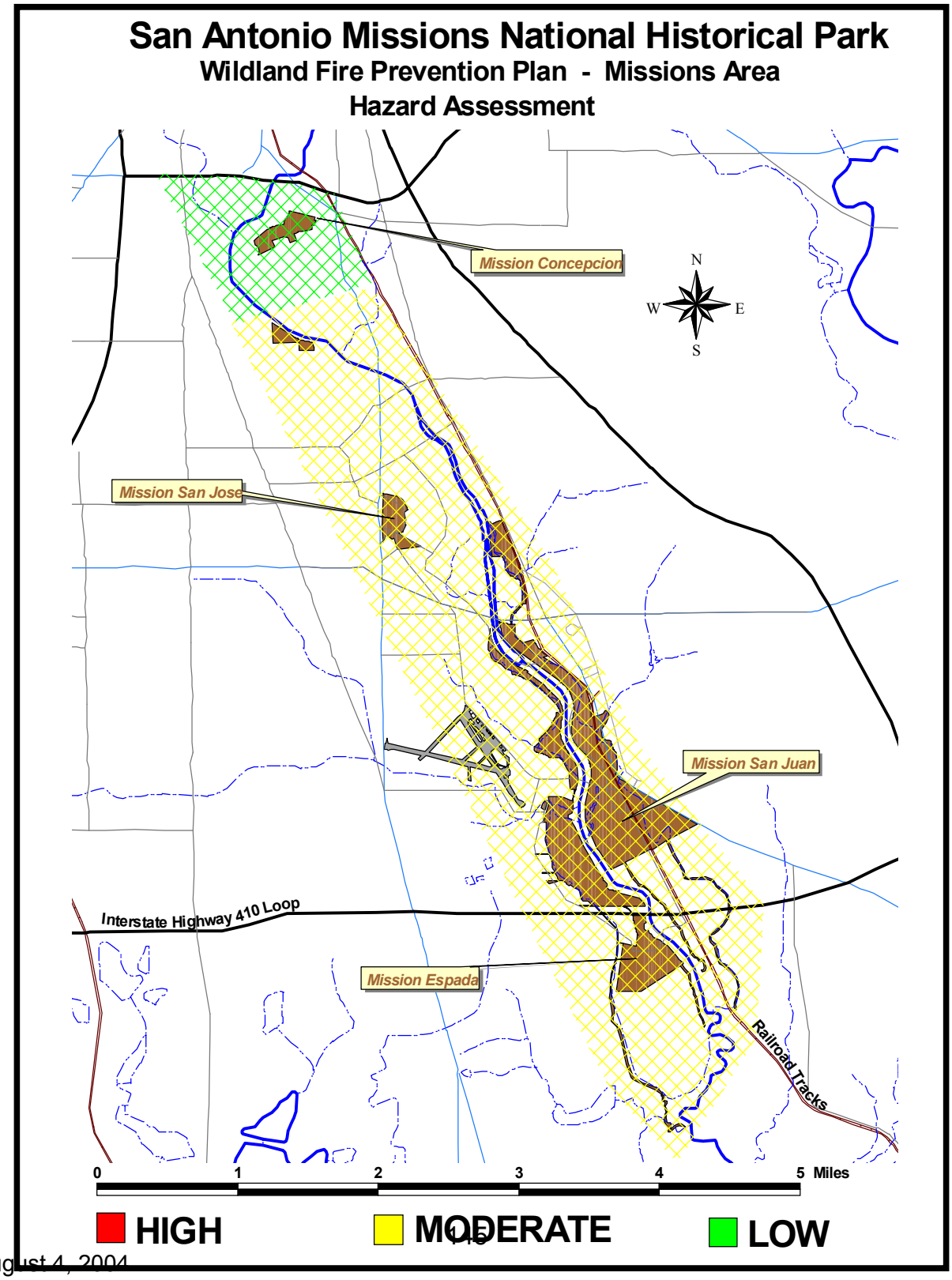
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Wildland Fire Prevention Plan - Missions Area
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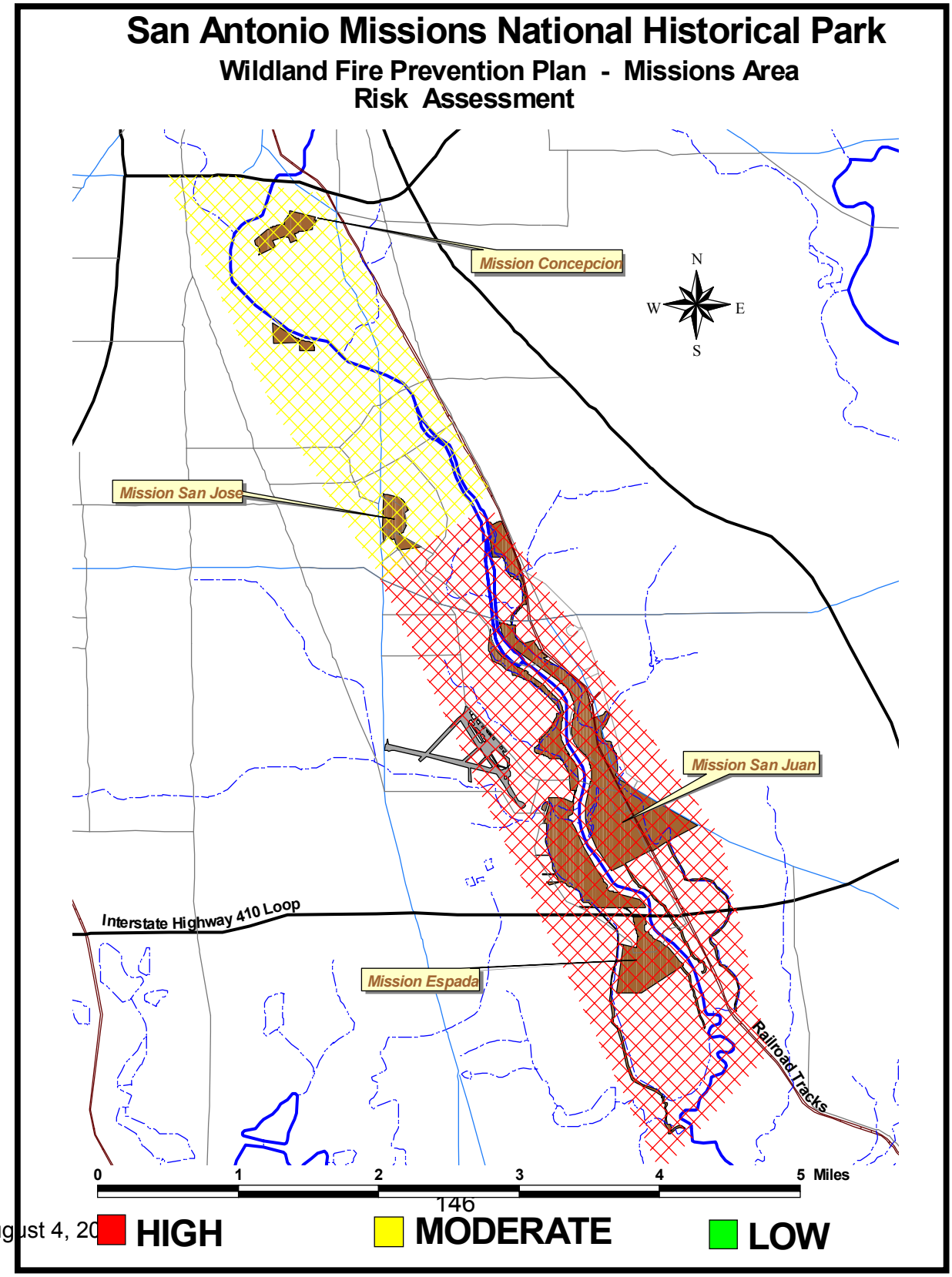
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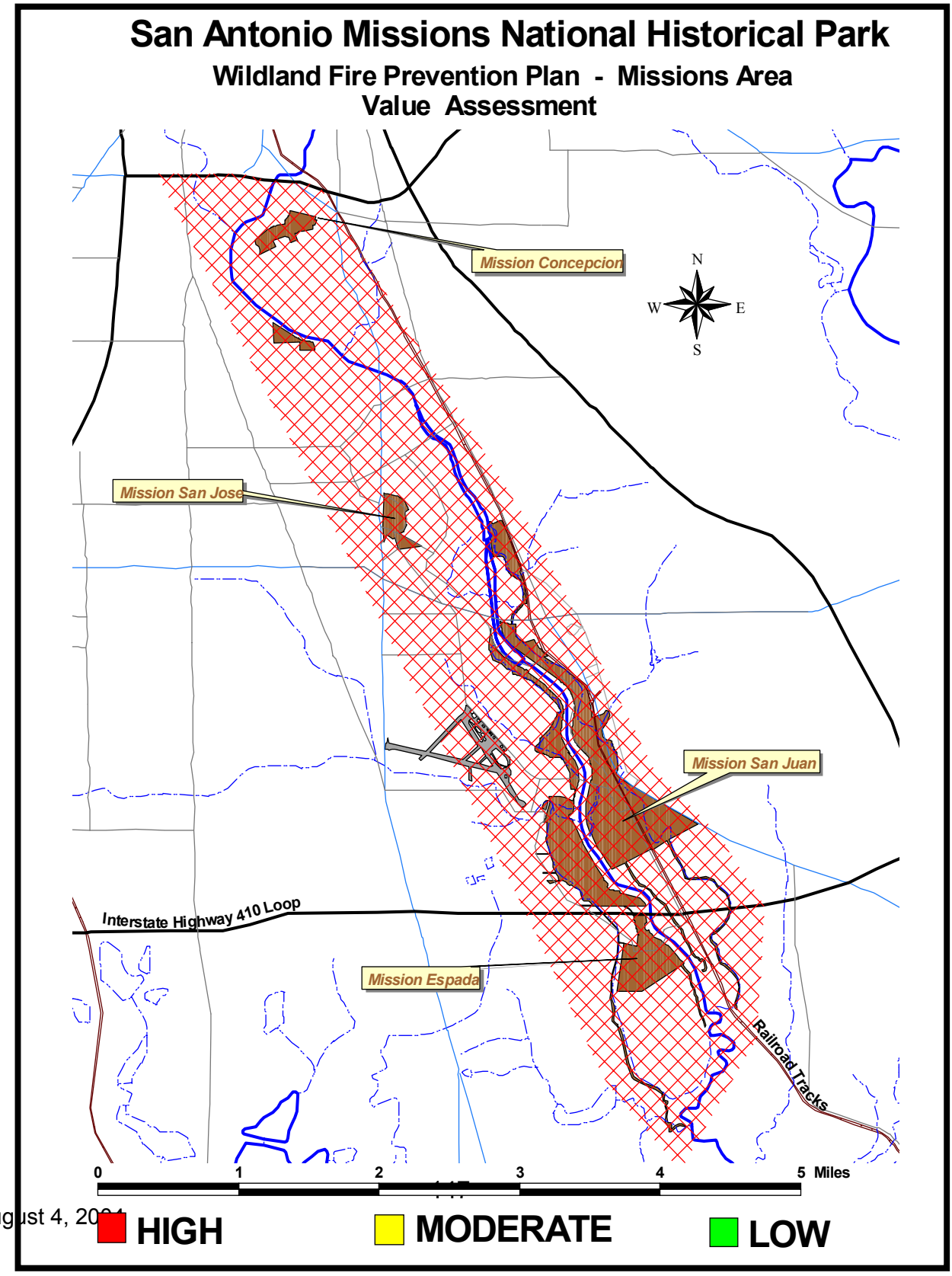
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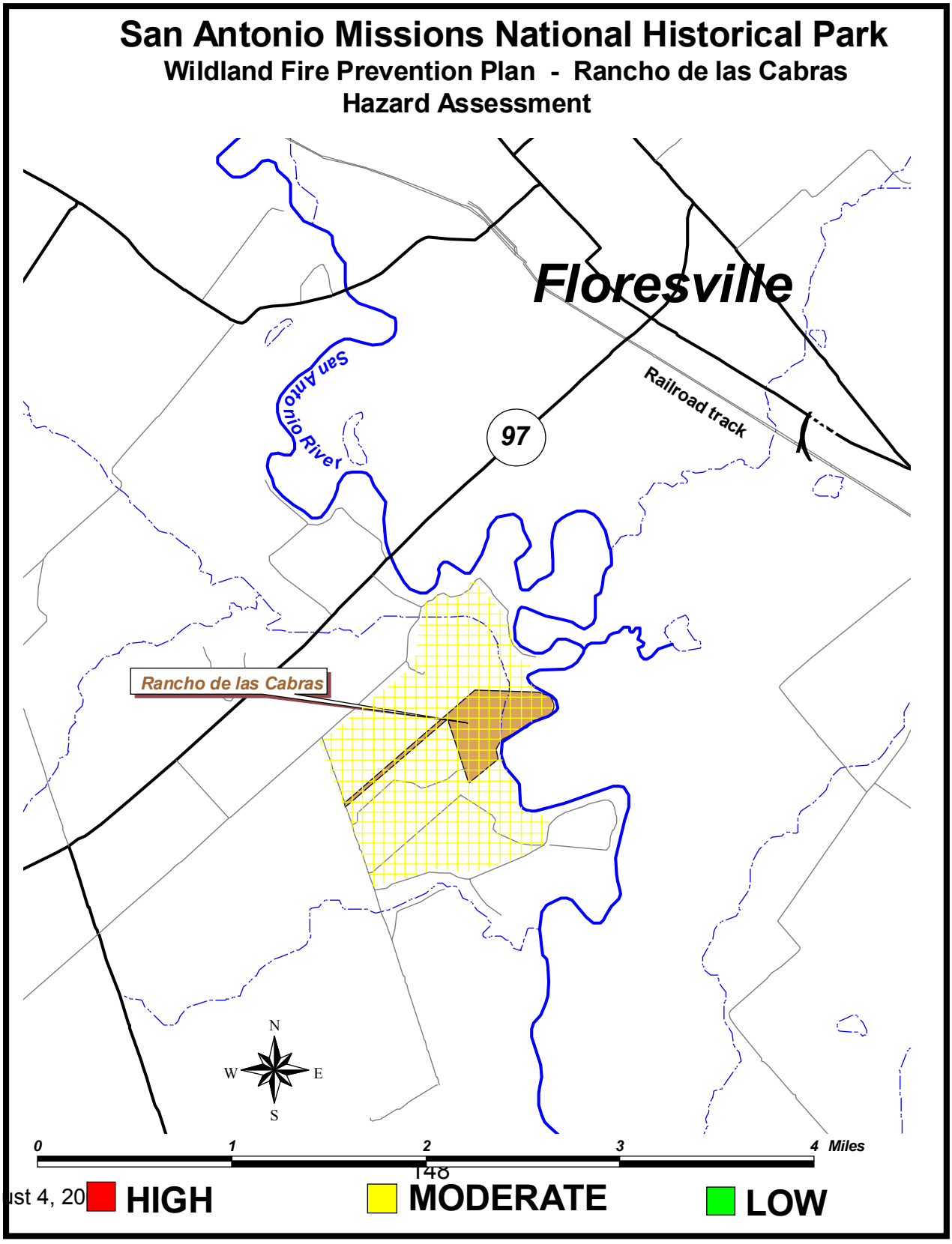
San Antonio Missions National Historical Park
Wildland Fire Prevention Plan - Rancho de las Cabras
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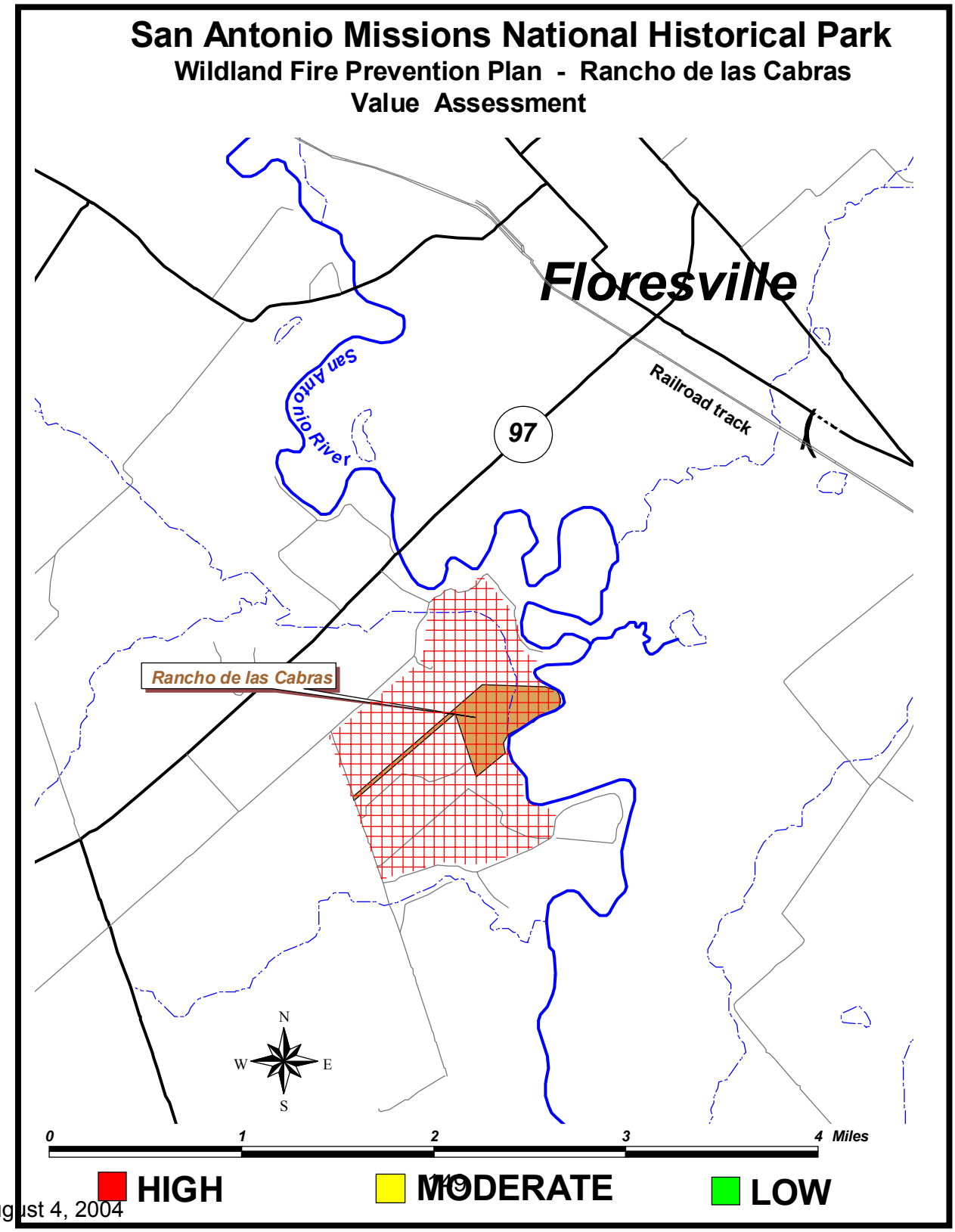
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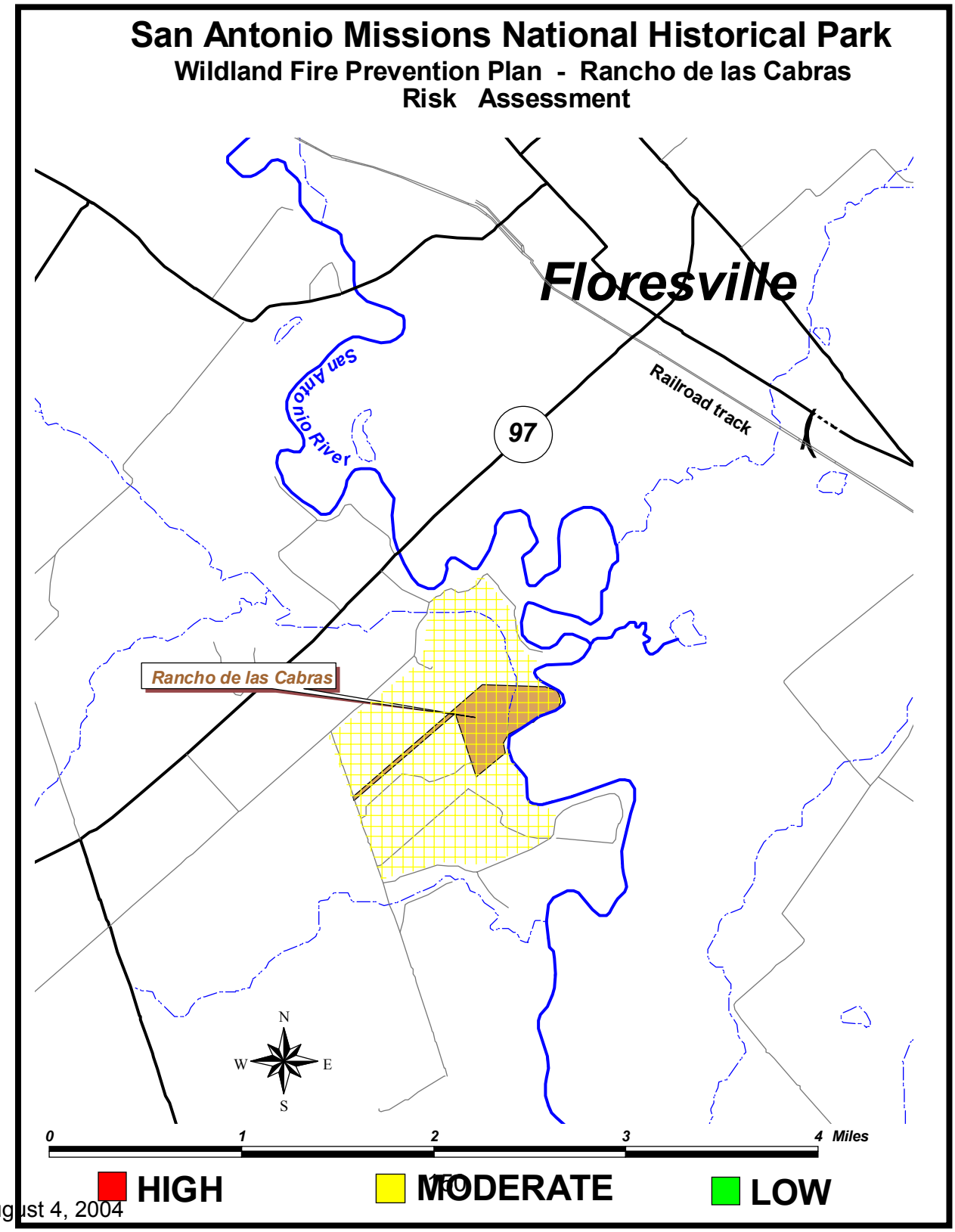
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